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PREFACE.

IN preparing this work, I have endeavoured to meet the requirements of the senior student and general practitioner, although I trust the following pages may not be altogether without interest for the laryngologist and aural surgeon.

Assuming that every reader will have at his command works on anatomy and physiology, I have not discussed the structure and functions of the parts, but have contented myself by incorporating in the text anatomical and physiological hints, where such are specially required on clinical grounds. All drawings of instruments have been omitted, because it has always appeared to me that they are unnecessary, for the very simple reason that the practitioner must possess the means of operating before he proceeds to operate.

It has been my earnest desire to omit nothing of importance, but, at the same time, I have endeavoured so to apportion the space as to attain the maximum of usefulness to the general practitioner.

The more common diseases have, therefore, been discussed at some length, while those which rarely occur have been dealt with more shortly. To the first of these statements there will be found a few exceptions. It will be noticed that certain very important subjects have had a comparatively small space allotted to them, *e.g.*, diphtheria and injuries of the larynx. This is, however, due, not to deficient appreciation of their importance, but to the fact that they are fully discussed in works on general medicine and surgery.

I have considered it desirable to make this explanation, as it has been necessary to economise space, in order to make the present work convey, within a volume of reasonable dimensions, the main facts of modern Laryngology, Rhinology, and Otology. Recent literature has been laid under contribution, so far as possible, and a sufficient acknowledgment will be found in the index of authors quoted. The coloured illustrations are all original, and most of them were drawn from my own patients by Mr. J. Bayne; two of them were, however, copied from sketches kindly furnished me by Dr. Felix Semon.

To Dr. Semon I am also greatly indebted for some valuable suggestions as to the chapter on laryngeal neuroses, a subject with which his name must remain for all time connected.

To Drs. Mackenzie Johnston and Horsley I am also under much obligation for their kind and valuable help, both in superintending the execution of the drawings, and for assistance and suggestions in revising proofs.

16 CHESTER STREET,
EDINBURGH, *December* 1891.

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THE PHARYNX.

DISEASES OF THE PHARYNX.

CHAPTER I.

METHODS OF EXAMINATION AND THERAPEUTICS.

EXAMINATION.

ALTHOUGH the pharynx, if considered from a strictly anatomical point of view, includes both the naso-pharynx and the sinus pyriformis, which can be examined only with the aid of the rhinoscope and laryngoscope respectively, yet most practitioners understand the term to mean so much of the throat as can be explored by using simply the tongue depressor. When it is desired to inspect this cavity the patient is placed so that his face is directed towards a window, or, better, in such a position that a strong light can be thrown into his mouth by means of a reflecting mirror. It is not necessary at present to discuss either the reflector or the form of artificial light best adapted for the purpose; both will be sufficiently considered under the section of this work devoted to the larynx. A sufficient supply of light having been obtained, the patient is next directed to open his mouth as wide as possible. In most persons it is at this stage necessary to depress the tongue. But whether the handle of a spoon, tooth brush, or an orthodox tongue depressor be employed for the purpose, matters little. The instrument I generally use is the ordinary bivalve metal apparatus, which can be made to answer all requirements, both for simple examination of the pharynx and for rhinoscopy. With it the tongue must be depressed by pressure exercised on its posterior part.

The pharynx is thus brought thoroughly into view, and its component parts can be examined. The condition of the *uvula* and *soft palate* is noted, the *tonsils* seen embedded between the *anterior* and *posterior pillars* of the fauces are inspected, and finally the *posterior wall* is studied. The colour of all these parts in health can be best described as a rosy pink. A slight degree of congestion may, however, often exist without causing any discomfort. It is also not uncommon to observe dilated blood-vessels coursing over the posterior wall. In the ideal throat the tonsils do not project from between the pillars of the fauces; at the same time it must be admitted that in quite a large number of persons, who, even in answer to leading questions, do not admit any throat trouble, these glands are more or less prominent. Before concluding an examination of the pharynx, it is always well to make the patient say "ah." This causes the soft palate to rise, and we are thus enabled to estimate its mobility; the elevation of the soft palate further enables us to see part of the posterior wall which has hitherto been excluded from view by the veil of the palate.

In young children it is sometimes no easy task to examine even the pharynx; but if the *suaviter in modo* fails we can always fall back upon physical force. If the child obstinately refuses to open its mouth the nose should be held, and thus the little patient is soon compelled to gasp for breath. The moment the jaws are separated a spatula is introduced and the tongue depressed. Occasionally, even in adults, difficulties are encountered; and in those of a gouty diathesis, and in persons addicted to the free use of stimulants, the throat and tongue are sometimes so extremely sensitive as to make examination very troublesome. Fortunately we have in cocain—applied either by means of a spray or brush—a means of overcoming such hyperæsthesia.

At the end of a pharyngeal examination it is often well to make the patient retch, as this act, by producing contraction of the muscles, enables the physician to see more thoroughly the lateral parts which are thus driven inwards towards the middle line. As we shall see later, the folds situated behind the posterior pillars of the fauces are often considerably thickened in certain cases of chronic pharyngitis. When the muscles of the pharynx are contracted this condition becomes evident, and the *hypertrophied lateral folds* can be seen as corded swellings behind the tonsils.

The method of examining the pharynx just described is sufficient in most cases, because further exploration can be carried on by means of laryngoscopy. It may, however, be desirable to gain a view of the deeper parts without the introduction of the mirror. For this purpose, a mode of examination first suggested by Voltolini is extremely valuable. The tongue of the patient is protruded and grasped between the index finger and thumb of the physician's left hand; with the middle and ring fingers he presses up the Pomum Adami. The tongue depressor is introduced, as far back as possible, with the right hand, and the tongue pressed downwards and forwards. In this way the epiglottis can often be seen *in toto*, and, according to Voltolini, even the arytenoid cartilages.

In certain cases it is desirable to make use of palpation by means of the finger, while in other instances it may be deemed advisable to introduce a probe. Neither of these manipulations, however, require any detailed discussion; they are, besides, rarely required.

GENERAL THERAPEUTICS.

In considering the therapeutic measures useful in pharyngeal disease, we shall, of course, confine our remarks to local applications, although the reader will find from a perusal of subsequent pages that general treatment is often of quite as much, if not of more, consequence.

The external *application of heat and cold* needs no detailed description. Fomentations afford a ready means of applying the one, and icebags or Leiters' tubes may be employed if cooling of the external surface be desired. A very popular remedy in Germany consists in the application of cold water cloths, surrounded by either oiled silk or a thick towel. The effect of this application is to dilate the cutaneous vessels. As a general rule, we apply cold when it is desired to check inflammation and prevent suppuration, and heat when it is considered advisable to hasten the formation of pus. In many acute inflammatory throat affections the direct application of cold to the affected part is both grateful to the patient and beneficial. This may be achieved by sucking ice, the consumption of fruit ices, iced drinks, &c.

Gargles have of late been somewhat disparaged by writers on throat disease. If, however, the method advocated by Von Tröltsch be enjoined, there can be no doubt that gargling is an efficient means of treatment in certain cases. The patient should take a mouthful of fluid, throw back his head, and then —instead of making the customary "gurgle"—allow the liquid to pass as far down as possible. The act of deglutition is then performed, without, however, letting the fluid be swallowed. Not only does this procedure permit contact with a large portion of the pharyngeal mucosa, but the effort involved affords an effectual means of exercising the muscles of the throat.

Lozenges and *compressed tablets* are much used in this country; but it must be remembered that although they afford an effective means of medicating the throat, they also act locally on the œsophagus and stomach, as well as generally on the system. Thus it may be desirable to apply an astringent locally, but it by no means follows that it is at the same time advisable for the patient to swallow the same class of remedy. I do not by any means desire to condemn this form of treatment, but only to point out this very manifest objection to its routine employment.

Inhalations of the steam of hot water impregnated with certain volatile substances are much employed. One of the most simple apparatus for this purpose is the inhaler known as "Maw's;" but a narrow-mouthed jug with, if necessary, a towel thrown over the patient's head, may be made to serve the same purpose. Care must of course be taken to avoid the use of steam at too high a temperature, which can usually be done without resort to a thermometer. When steam inhalations are used, it is always a question how much of the benefit is derived from the aqueous vapour, and how much from the small quantity of volatile substance which it is customary to add to the hot water. The inhalation of *nascent chloride of ammonium* belongs to quite a different class of remedies. It is now more or less generally recognised that this vapour, when applied to catarrhal mucous membranes, has a very distinctly beneficial action. I do not think its *modus operandi* has yet been thoroughly explained, but the clinical fact remains. There are quite a number of different instruments by means of which chloride of ammonium may be inhaled, but the one I invariably employ is that known as "Godfrey's." The advantage of this inhaler is that the combined fumes of ammonia and hydrochloric acid are sucked through a moist sponge instead of through water, so that by sprinkling it with a few drops of some volatile substance—such as oil of pumiline—a mixed inhalation can be administered; further, it seems to me that the volume of chloride of ammonium produced is greater than in most of the other inhalers.

Sprays are seldom used in pharyngeal disease, but sometimes their employment is indicated in persons whose throats are so extremely sensitive that a brush cannot be tolerated. I do not think it matters much what form of instrument is employed, provided always that a considerable volume of a fine spray is produced. The steam spray on the principle of Siegle is often less efficacious, and certainly more troublesome, than the more simple instruments, for, when steam power is used to replace compressed air, the medicament is liable to be unduly diluted by admixture with aqueous vapour. On the other hand, a steam spray may, in acute conditions, be found more beneficial, owing to the combination of moisture and warmth. Should it be considered desirable to employ *vaseline or some other oleaginous substance in the form of a spray,* the most convenient apparatus is that known as the "De Vilbiss' Spray."

Pigments form one of the most serviceable methods of treating pharyngeal disease. They may be applied by means either of a brush, or, if it be preferred, a specially constructed instrument, round which a piece of cotton wool is twisted and fixed so as to prevent all danger of its falling off. The brush is dipped into the solution and applied to the pharynx moist, but not dripping, otherwise a drop may, by falling into the larynx, cause undue irritation and spasm. Most patients are well able to carry out this manœuvre for themselves, and, in the case of children, the mother or nurse is usually quite competent to execute it. The only precaution to be taken is to direct that the brush be examined before each application in order to ensure the absence of all loose hairs.

Insufflation of powders is little used in the treatment of the pharynx, but if the physician desires to employ this method, he can easily procure an instrument on the principle of the laryngeal insufflator, with a straight instead of a bent tube.

Scarification of the tonsils, or other parts, is often indicated. For this purpose the most useful knife is that known as *Morell Mackenzie's pharyngeal bistoury.* It is merely a fine, curved, pointed bistoury, with a very short cutting edge, and long, slender shaft.

Caustics, when used in the throat, are employed for the purpose of destroying redundant tissue. To prevent misconception, I may here state that the solutions of nitrate of silver, so useful in many chronic cases, are not so much caustic in their action as astringent and protective, owing to the formation of a superficial layer of albuminate of silver. When a destructive action is desired, I believe that the two most effective agents at our command are—(1) *the electric cautery;*

purpose, as steel or piano wire is both cheaper and more convenient. The battery may be said to be in proper working order when a loop of wire, considerably larger than the pedicle of the growth to be encircled, is made to smoke, although it remains black. We have somewhat anticipated in discussing the galvano-caustic snare, as it is extremely uncommon to find occasion for its employment in the pharynx; but needless repetition will thus be avoided in a subsequent chapter.

To those who have no electric cautery at command, the use of chromic acid as a destructive agent may be recommended. A silver probe, roughened at its extremity, is dipped into a bottle containing crystals of chromic acid, until a number of these attach themselves to it. The probe is now held over a spirit flame until a bead of a dull red colour is formed. This, if applied to hypertrophied mucous membrane, will be found to be a very effective destructive agent. It is always well, however, to limit its application at one sitting to a small area, and also to make the patient gargle with, and even swallow, a portion of a solution of bicarbonate of soda soon after the operation. If these precautions be neglected, symptoms of irritant poisoning may occur, *e.g.*, sickness and depression. I am aware that many other agents—of which the most commonly employed is nitrate of silver—have been used as caustics, but I do not think that they are at all comparable, in point of efficacy, with those described.

Massage of the pharynx has so far not been used to any great extent. Kellgren, however, has recorded a case of post diphtheritic paralysis cured by this plan of treatment. He used three distinct exercises, viz. (1) By placing two fingers as far back as possible on one side of the root of the tongue, and making with them a quick, shaking movement upwards, and slightly forward; (2) By grasping the root of the tongue between the fingers and thumb and shaking in a lateral direction; (3) By placing the tips of the fingers behind the ascending ramus of the lower jaw and making a vibrating movement inwards, forwards, and downwards. Whether this mode of treatment will prove useful in other forms of throat trouble must at present be left an open question.

The *application of electricity* to the pharynx is sometimes indicated, but the laryngeal electrode will be found quite suitable for this purpose.

Anæsthesia of the pharynx may be obtained by the use of a solution of hydrochlorate of cocain, which may be employed in a concentration of from 10–20 per cent. When it is only desired to affect the pharynx it is best to use a brush, and apply the drug with considerable energy, for the more thoroughly it is brushed the more complete is the resulting anæsthesia. After its application, some patients complain much of the feeling of a "lump in the throat," and become restless, being rendered nervous by the supposed presence of a foreign body. A few reassuring words, however, are usually sufficient to obviate any difficulty due to this cause. Alarming toxic symptoms I have so far not encountered, although they have been described. Menthol (20 p.c. sol. in olive oil) has also an anæsthetic action, but is considerably inferior to cocain in its effects.

CHAPTER II.

ACUTE INFLAMMATIONS.

ACUTE CATARRH.

THIS affection is well known by personal experience to most of those who live in our changeable climate. The most common cause no doubt is "catching cold." Probably those of a gouty or rheumatic diathesis are especially prone to suffer from acute pharyngitis, although it is somewhat difficult to prove this by statistics. Whether or not the condition can be propagated by contagion is doubtful; although popular prejudice is in favour of this view. It certainly occurs more frequently during autumn, winter, and spring than in summer. It is uncertain if the strumous diathesis has any special effect in predisposing to pharyngitis, but at the same time it must be admitted that any condition which weakens the powers of resistance would probably have this result. I do not, however, remember in hospital out-patient practice to have seen any great number of tubercular patients afflicted with catarrhal angina. In certain acute diseases it is frequent, *e.g.*, measles, scarlatina, rötheln, small-pox, and typhoid, while it is a common manifestation in syphilis[1]. Pharyngitis may also owe its origin to drugs, such as iodide of potassium, mercury, antimony, and arsenic. Mechanical irritants, such as spices, alcohol, and tobacco, must certainly be considered as possible factors.

The *symptoms* of simple pharyngitis are so well known as to require little description. A feeling of chilliness, aching in the back and limbs, slight or even rather severe pain on deglutition, with a tendency after a time to expectorate mucus, are the most prominent manifestations. More or less cough, too, is often present, and, if the inflammation extends to the larynx, hoarseness may be complained of. On examining the throat, the whole mucosa of the palate, tonsils, and posterior wall, is seen to be deeply congested, and the lateral folds not uncommonly become abnormally prominent.

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[1] This form will be discussed in the section devoted to syphilis of the pharynx.

Sometimes the uvula is attacked by œdema and forms quite a large tumour, to the no little discomfort and alarm of the patient. In rare instances the intensity of the inflammation seems to cause destruction of the superficial layer of epithelium, and an appearance is thus produced which might easily be mistaken for a mucous patch.

The *prognosis* of simple angina is always favourable, although repeated attacks may lead to chronic catarrh. It must, however, be remembered that certain serious conditions may, in their early stages, simulate simple pharyngitis.

In most cases little *treatment* is required; indeed the physician is rarely consulted. In some persons, a dose of quinine taken at the commencement of the attack tends to cut it short, and the same may be said of the use of the chloride of ammonium inhaler. When it is evident that efforts to abort the disease are useless, 10 grs. of Dover's powder (Pulv. Ipecac. Co.) preceded by a warm foot-bath, to which some mustard has been added, and followed by some hot whisky and water, or mulled claret, will often shorten the duration of the complaint. It is also beneficial to apply a cold water compress covered with oiled silk to the throat. If there be much aching of the limbs, salicylate of sodium, salol, or salicin, should be administered, while it is then specially desirable that the patient should stay in his room or even in bed for a day or two. If the uvula be much swollen from œdema, a small piece should be snipped off its extremity by means of suitably curved, blunt-pointed scissors.

The tendency to catch cold is fostered by sitting in ill ventilated and hot rooms. A plentiful supply of fresh air, avoidance of draughts, wet clothes, and above all, wet feet, wearing flannel under-garments, and cold sponging—or better, bathing when it agrees—help to produce immunity.

SEPTIC PHARYNGITIS.

It has seemed convenient to arrange under this heading such forms of pharyngitis as are now held to be due to general or local septic absorption. It will, however, be necessary to subdivide this heading to meet clinical requirements.

(1.) *Slight Septic Inflammation.*—This affection, described as ulcerated sore throat by Morell Mackenzie, and popularly known as hospital sore throat, is often seen among those who are much exposed to organic poisons. Bad drains, contact with decaying organic matter, and polluted milk may each cause septic sore throat. The *symptoms* are those of an ordinary angina, the pulse and temperature are raised, the limbs ache, and there is, of course, loss of appetite, thirst, and general feeling of illness. On examining the throat, the tonsils[1] especially are seen to be swollen, and often covered with patches. The deposit is caused by the suppuration of the lymphoid follicles; the irritation so produced gives rise to a fibrinous exudation, and, as a result, we have a considerable surface of one or both tonsils covered with a grey membranous-looking substance, which refuses to be wiped off. If the patient be made to retch, however, cheesy masses may be extruded, representing the exudation which has formed in the crypts. As the disease abates it becomes evident that a certain loss of substance has occurred. Whether this appearance of ulceration is only met with in septic cases I am not prepared to say; at the same time I always consider it as strongly suspicious of this condition. The glands about the angle of the jaw are often more or less enlarged.

The *prognosis* is always favourable; but it must be admitted that at first care and even patience may be necessary before the possibility of diphtheria can be excluded.

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[1] This affection may be looked upon as one of the forms of tonsillitis; its septic origin having been definitely admitted, I have, at the risk of repetition, included it here.

The *treatment* need not be very energetic. Antiseptic gargles, *e.g.*, water coloured with Condy's fluid, or a saturated solution of chlorate of potassium or boracic acid, may be used with advantage. Painting the throat with a solution of menthol (20 p.c. in olive oil) will be found useful, as this drug combines the properties of an anæsthetic and antiseptic. To some patients, however, the smarting produced by this application, before the anæsthetic action is obtained, is extremely disagreeable. If painting and gargling are contra-indicated on account of great pain, a spray of corrosive sublimate (1-2000) will be found very effective. Sucking pieces of ice, and ices, are often grateful, and at the same time quench thirst. Whenever it is considered safe, change of air must be insisted upon, while good diet, wine, and tonics, are also indicated during convalescence.

(2.) *Phlegmonous Sore Throat (also called Erysipelatous).*—Strictly speaking an abscess of the tonsil is also a phlegmonous inflammation; but the form of sore throat now to be described is characterised by a diffuse phlegmon of the pharynx, with a marked tendency to spread to the larynx and produce a fatal result. This disease has been described by Senator as "acute infectious phlegmon of the pharynx," and he has given a detailed account of four cases. To use his own words, "it is an acute, febrile disease, beginning with moderate rise of temperature, in which sore throat and pain on swallowing soon set in, followed by laryngeal symptoms, consisting of more or less hoarseness and dyspnœa. Finally consciousness is lost, and death soon follows, without any of the vital viscera being affected. On dissection diffuse purulent infiltration of the deeper parts of the pharyngeal mucosa is found. This condition extends to the larynx and glands, involving secondarily other structures, and thus the clinical symptoms are accounted for. The disease has so far attacked perfectly healthy persons, and no definite cause could be assigned for its appearance." Endeavours to detect a special micro-organism have so far failed, and Senator is inclined to consider the affection as one hitherto undescribed. In most of Senator's cases there was albuminuria, and in some the spleen was also enlarged; these conditions are, however, equally met with in most septic fevers.

Erysipelas, however, when it affects the pharynx, corresponds very closely in its clinical history and course with Senator's infectious phlegmon. This disease usually attacks the pharynx by extension from the face, but the throat may be first involved. There is a feeling of illness, a rise of temperature, followed in from twenty-four hours to a few days by sore throat. The mucous membrane is red, infiltrated, and swollen, while extension to the larynx is apt to be followed by œdema and death. There is also, of course, the additional risk of extension to the trachea, bronchi, and lungs. In pharyngeal erysipelas the streptococcus of Fehleisen has recently been demonstrated by Cardone.

As to *treatment*, in the absence of proof to the contrary, it will probably be better to consider Senator's disease as erysipelatous. Large doses of tincture of the perchloride of iron and stimulating regimen form the basis of treatment. Sucking ice with a hope of checking the inflammatory swelling is advocated by most authorities; and when, owing to extension to the larynx, suffocation theatens, tracheotomy is called for.

(3.) *Gangrenous Pharyngitis.*—Although gangrene may result from such diseases as diphtheria, phlegmonous inflammation of the throat, retro-pharyngeal abscess, scurvy, scarlatina, measles, typhoid, and small-pox, and as a consequence of operative measures, yet there is a variety which seems to result only from very severe blood poisoning.

The disease is extremely rare, and we need not, therefore, devote much space to its consideration. The patient complains of sore throat, and is often feverish. Soon the breath becomes intensely fœtid, and gangrenous spots begin to be observed, usually on the palate or tonsils. The temperature and pulse-rate fall, and death from syncope or coma usually terminates the scene.

The *prognosis* of gangrenous pharyngitis, whether primary or secondary to other diseases is extremely unfavourable.

As to *treatment*, antiseptic gargles, mouth washes, or pigments are commonly used. General stimulants and concentrated nourishment, however, afford the best means of combating a disease which cannot be treated with much hope of success.

DIPHTHERIA.

Whether diphtheria be a local disease, which rapidly involves the whole system, or due to a general infection, which manifests itself by a peculiar condition of the upper air passages, we must still leave *sub judice*.

Diphtheria is an affection which usually shows itself by the presence of false membranes in the pharynx, larynx, or nose; occasionally the mucosa of other parts is involved, and rarely the external skin. It is universally admitted that the disease is contagious when it occurs primarily. Occasionally, however, it follows some acute disease, and is then termed secondary. Whether this form is very acutely contagious seems open to doubt.

The period of incubation varies from two up to fourteen days. As predisposing causes must be named youth—children from 1 to 12 being most susceptible—damp, cold, and ill-ventilated dwellings, and the presence of catarrh in the respiratory passages. Whether a previous attack confers any immunity, or whether we can hope to attain such immunity by means of protective inoculation, is still undecided. As to the actual etiological factor, the great question to be decided is, whether the disease is, or is not, due to a special microbe, and, if so, whether this has been distinctly demonstrated. If this fact be once established, it is not difficult to understand how the organism may be propagated by means of milk and even food. From the researches of Löffler, Emmerich, Roux and Yersin, it seems probable that there is a bacillus which, when inoculated, tends to produce diphtheritic inflammation; but this view is not by any means universally accepted, and Prudden has adduced strong evidence to show that the most commonly found micro-organism in diphtheria is a streptococcus quite similar to the streptococcus pyogenes. From some recent records, it seems not improbable that sewer gas may be, under certain circumstances, a very active agent in the production of diphtheria. Taylor considers that harmless organisms may, under favourable conditions, develop so as to produce the diphtheritic poison; while the view that decomposing excreta, as found in manure heaps, may originate the disease, finds considerable support. Whether or not diphtheria can be conveyed to man from the lower animals, especially birds and cats, must also be left an open question.

Microscopically, the false membrane in pharyngeal diphtheria is composed, according to Woodhead, of micrococci, epithelium, fibrin, and leucocytes; eventually, fatty degeneration of the connective tissue takes place, and the lymphatics become choked with fibrin and sometimes with micrococci.

According to Schech, the disease is apt to occur suddenly in young children, with rigors, sickness, pain in the head and limbs; while in adults it comes on more slowly, much like an ordinary sore throat. Erythema of the arms, neck, chest, and thighs may occur at this period, as also patches resembling urticaria. According to the same author, the presence of petechiæ must be looked upon as indicating the commencement of a grave attack. Pain or discomfort in the throat soon follows, and, on inspecting the pharynx, patches of false membrane are seen on the tonsils or palate, and sometimes also on the posterior wall. The colour of the exudation varies; sometimes it has a delicate hoar-frost like appearance, but at a later stage it becomes more yellow and even blackish grey.

The false membrane is more or less intimately attached to the mucosa; if forcibly detached a bleeding surface is left, and it is soon reproduced. If the case be seen very early the exudation may not have had time to form, and it is also probable that some exceptional cases of diphtheria run their course without the formation of false membrane. A very peculiar form has been described by Barrett as *diphtheria circumscripta*, in which a distinct circumscribed slough appears on one tonsil, and death often results. One might think that these cases are identical with pharyngeal gangrene; but in those described by Barrett, where recovery ensued, paralysis followed. Swelling of the cervical lymphatics and submaxillary glands is almost, if not quite, a constant phenomenon in pronounced diphtheria. The temperature varies, sometimes reaching 104° quite soon after the first indications of illness. The increase in body heat seems to bear a more or less direct proportion to the amount of false membrane present. A sudden falling of the temperature may, however, indicate a tendency to cardiac paralysis or death from asphyxia.

The pulse is usually considerably quickened, and may be strong or the reverse. In out-patient practice I am always rather suspicious of a doubtful throat affection when the pulse is rapid and weak.

The disease may extend *to the nose* when the voice becomes extremely nasal in timbre, and other manifestations of nasal obstruction associated with an acrid discharge are also present; rhinoscopic examination, if practicable, will reveal the presence of false membrane.

Thirst, loss of appetite, and general malaise continue throughout the disease, which may last from a few days to several weeks. In mild cases the membrane disappears early, and the patient begins to recover; but, on the other hand, it not unfrequently happens that fresh exudation is thrown out with a concomitant general relapse.

Extension of the diphtheritic process to the *larynx* is a most serious complication, especially in children. Hoarseness, followed by aphonia, croupy cough, and, finally, dyspnœa, indicate this unfavourable complication. If laryngoscopic examination be possible and, considering the general condition, justifiable, the diagnosis may be thus assured. The trachea and bronchi may also become involved, giving rise either to signs of bronchial inflammation or pneumonia. According to Schech, septicæmia may result from diphtheria, and this usually begins after the first week of illness. In other cases, there is a tendency to secondary gangrene of the throat. In either event, the prognosis is extremely grave.

In *malignant diphtheria* the disease begins, according to Morell Mackenzie, with rigors, headache, and vomiting, often accompanied by bleeding from the nose. The exudation in the throat tends rapidly to decompose, and a fatal typhoid state soon sets in.

The same author has also observed cases of *chronic diphtheria* which lasted for some months. These patients were able to attend hospital, but for a time the membrane, if removed, rapidly recurred. Of eleven examples observed, in three there was a deposit in the larynx, and in four albuminuria was also present. Eventually the tendency to the formation of false membrane disappeared.

Albumen is often present to some extent in the urine of diphtheritic patients, but its amount may often vary, even in the same case, from day to day. Schech considers that the danger of uræmia in this disease is under-estimated by most authorities.

Both throughout the disease and during convalescence the physician should be on his guard to prevent any sudden exertion on the part of the patient, as a tendency to *cardiac paralysis* is often a marked feature of the disease.

The commonest *sequel* in diphtheria is paralysis, which may occur at any time during convalescence up to six weeks afterwards. The pathological factor of this complication has been now determined to be a polyneuritis. The parts most commonly affected are the muscles of the pharynx, while the larynx is less frequently involved. Together with loss of motion, sensibility may be impaired or lost, and this symptom, when affecting the larynx, may lead to the passage of food into the trachea and secondary pneumonia. Almost any muscle may, however, be affected; fortunately the diaphragm is rarely paralysed, but when this complication occurs there is considerable danger, owing to the deficient breathing power which results. Post diphtheritic paralysis always disappears in from a few weeks to six months. This desirable result may, however, be expedited by the use of electricity and strychnine. Although not a common cause of chronic *otitis media suppurativa* I have seen most obstinate otorrhœa, with great destruction of the membrana tympani, follow primary diphtheria. When the disease is secondary to scarlatina it is very liable indeed to cause destructive inflammation of the middle ear.

The *diagnosis* of diphtheria is no doubt extremely difficult, and it is a mistake often committed by writers to underestimate this difficulty. Thus, in certain cases of scarlatina, we find a membranous sore throat occurring at an early stage, and when it is remembered that in diphtheria we may have an erythematous skin rash, and further, that in both diseases the urine is often albuminous, the extent of the difficulty will be appreciated. Albumen, however, appears in the urine at a somewhat later period in scarlatina than in diphtheria. Confluent herpes of the throat is a rare disease, but when it occurs is difficult to distinguish from the affection we are discussing. The cases which present perhaps most difficulty are those of follicular and lacunar tonsillitis, with considerable exudation. In these diseases the glands of the neck may be, indeed often are, enlarged, and in aggravated instances the patches of exudation tend to coalesce. The relation of these diseases to diphtheria still requires elucidation, for one of the most marked examples of lacunar tonsillitis I have ever seen terminated in fatal diphtheria. The patient came to the infirmary as an out-patient, complaining of sore throat and feverishness. On examination the tonsils presented the appearance of being studded with points of secretion, apparently issuing from the crypts—a condition sometimes spoken of as pathognomonic of the milder affection, and yet the patient succumbed to diphtheria. The amount of general disturbance, the presence or absence of albuminuria, and the character of the pulse should, in doubtful cases, be carefully considered, and even then the difficulties in arriving at a positive opinion may be great. The presence or absence of an epidemic may also aid diagnosis. Most physicians will probably consider all cases of acute sore throat in which membranous exudation appears on the soft palate as diphtheritic, although Schech quotes Bamberger, B. Fränkel, Henoch, and Strumpell in favour of the occurrence of a simple croupous angina, in which the fibrinous deposit appears on the soft palate.

The *prognosis* of diphtheria is always grave. The extent of the false membrane is of some importance, inasmuch as the case is more favourable when it is confined to the tonsils and palate than when the posterior wall is also involved. The prognosis is more favourable in adults and older children than in those under six; among the latter again the case is grave in proportion to the youth of the patient. The character of the epidemic, too, must be taken into account, for if there be a general tendency to the septicæmic type, the disease is much more likely to prove fatal. Extension to the larynx and lungs renders the prospect grave, more especially in young children. Weakness of the pulse is unfavourable, as showing a tendency to cardiac failure. Bleeding from the nose, purpuric spots, persistent vomiting, and diarrhœa are all of grave import.

There are few diseases for which so many methods of *treatment* have been suggested; many of them, unfortunately, resting their claims on unreliable data.

The patient should, of course, be isolated, and the house disinfected as far as possible; and further, all the usual precautions required in the presence of acute infectious disease, must be attended to. The sick-room should be airy and of a moderate equable temperature—about 60°.

One of the chief indications in the *treatment* of diphtheria is nourishing diet, which should be given often and in small quantities — care being taken that nutrition is continued throughout the night. Lennox Browne recommends iced milk sweetened with sugar, iced beef-tea and yolks of raw eggs—the last named, in the case of adults, to be swallowed whole. In children, feeding may present great difficulties, but it must, of course, always be insisted on, and in case of need, nourishment may be administered *per rectum*. It is probably best to begin the treatment with small doses of alcohol, and to increase the amount whenever there is any appearance of cardiac weakness. According to Roux[1] and Yersin, the activity of the diphtheritic poison is diminished by heat; should this observation be confirmed, the propriety of the exhibition of ice will have to be reconsidered. As to the remedies to be employed, opinion is at present much divided. Most authorities believe that any violent attempts to remove the false membrane, and the application of strong caustics, are contra-indicated. On the other hand, keeping the patient in a constant atmosphere of steam, seems in the great majority of cases, to answer well. Jacobi speaks highly of the beneficial effects of turpentine and carbolic acid added to the water from which the steam is generated. Antiseptic remedies may be employed by spraying into the throat at intervals solutions of carbolic acid (5-10 grs. ad ℥i.); boracic acid (20 grs. ad ℥i.); or corrosive sublimate (1-2000, with the steam spray producer); indeed any of this numerous class of remedies may be used in this way. Dr. Pairman has recorded some very excellent results from the combined evolution of steam and sulphurous acid in the sick-room. Heubner, in scarlatinal diphtheria, advises interstitial injections of carbolic acid (3-5 per cent.) into the tonsils. Nepven recommends the employment of corrosive sublimate in like manner in the primary disease. The method is, however, so novel, that no definite opinion can yet be expressed upon its merits.

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[1] The same observers have also found that the diphtheritic virus is much more active in an alkaline than in an acid medium.

In the case of adults, gargling and washing out the mouth with an antiseptic solution is often useful, while in young children this mode of treatment is hardly practicable. Solutions of chlorate of potassium, permanganate of potassium, boracic acid, &c., may be employed for this purpose. Various remedies are also applied by means of brushing the diseased parts; tincture of perchloride of iron, syrup of chloral (gr. xxv. ad ℥i), a solution of boro-glyceride in glycerine (1-3), carbolic glycerine, and a host of other drugs, have been used in this way. Another class of remedies is employed with a view to dissolving the false membrane. These are used either as sprays or pigments, *e.g.*, papayotin (25 grs. ad ℥i.); pepsin (16 grs. ad ℥i., with a few minims of hydrochloric acid); lactic acid (25 grs. ad ℥i.) and lime water. Then again, a varnish, composed of an ethereal solution of balsam of tolu, is recommended by Mackenzie.

It is quite impossible to go over in detail even a fraction of the innumerable remedies which have been recommended in diphtheria and vaunted as specifics.

In addition to local treatment and feeding, general remedies should be exhibited. Probably the best of these is the tincture of the perchloride of iron in 30 minim doses for an adult, diluted with water and glycerine. Of late the administration of mercurials has tended to come into fashion again. Chlorate of potassium and sulpho-carbolate of sodium have also been used as internal antiseptics. It goes without saying that special indications must be attended to in the treatment of this disease; for example, a very high temperature calls for the administration of quinine, antipyrin, or antifebrin. Threatened collapse necessitates alcohol and ammonia, or other diffusible stimulant, while pulmonary complications must be also treated on general principles. When the diphtheritic process has extended to the larynx, tracheotomy may become necessary. It must, however, be remembered that this is very apt to be fatal, especially in young children. Intubation of the larynx has lately been revived by O'Dwyer, and, on his recommendation, has also been tried by many authorities. The general conclusion seems to be that in young children it is quite equal, if not superior, to tracheotomy. Should the latter become necessary the after treatment must, of course, be conducted with the greatest care; but this subject belongs more to the domain of the general surgeon.

In nasal diphtheria, in addition to other treatment, the nostrils should be washed out with a tepid antiseptic solution, or with lime water; to effect this probably the spray is safer than the syringe, as the latter may drive the diseased secretion into the middle ear.

It will be seen from what has just been stated that the remedies recommended in the treatment of diphtheria are legion. I shall, therefore, give shortly some general indications, which, although possibly not applicable to every case, will be found safe rules of practice:—

(1.) Place the patient in a well ventilated room.

(2.) Attend to the administration of concentrated nutritious diet, with small quantities of alcohol.

(3.) Surround the patient with steam; but if it should be found depressing and annoying discontinue it.

(4.) Spray or paint the throat with some antiseptic or solvent (sometimes the two may be used alternately); but if each application involves a struggle it is probably better to discontinue this plan of treatment and to use some antiseptic such as turpentine, which can be mixed with the water used for producing the steam.

(5.) Administer perchloride of iron, with or without chlorate of potassium. Sulpho-carbolate of sodium (15 grs. for an adult) may also be given.

(6.) Be prepared to counteract special symptoms, such as rise of temperature (quinine, antipyrin), and especially weakness of the heart (increase of stimulants, ammonia, digitalis).

(7.) Avoid exertion on the part of the patient.

(8.) During convalescence use tonics, cod liver oil, &c. Prescribe change of air. If paralysis follows, electricity and strychnine (either by the mouth or subcutaneously) should be employed.

(9.) If implication of the larynx is causing dyspnœa do not delay tracheotomy—or, in young children, intubation—too long.

CHAPTER III.

ACUTE INFLAMMATIONS—(*continued*).

HERPES.

As to the etiology of this affection there is considerable diversity of opinion. While cold seems to exercise a very marked influence in its production, some authors believe, not without reason, that neurotic influences have also a direct share in its etiology.

The disease may attack either the palate or tonsils; it may, further, be unilateral, or extend to both sides. As a rule, the patient has initial symptoms of pyrexia and general malaise, soon followed by smarting pain in the throat, aggravated by swallowing. This stage is followed by the appearance on the palate, tonsils, or, more rarely, the posterior pharyngeal wall, of small white opalescent vesicles. These finally burst and give rise to shallow, white, depressed erosions, and it is said by some authorities that in severe forms of the disease they may coalesce and resemble diphtheria. For my own part I have not found the affection common, but the small white ulcers, resembling miniature saucers, are not usually difficult to distinguish.

Herpes tends to cure of its own accord, so that, in most cases, purely symptomatic *treatment* is required. Cocain (10 per cent.), or menthol (20 per cent. in olive oil), applied locally to relieve pain, will at once suggest themselves to the practitioner as suitable remedies. If the patient be of a rheumatic diathesis, salicin or salicylate of sodium should be employed; while, if the temperature be high, other drugs, such as quinine, may be indicated.

Pemphigus has been described as occurring on the pharynx, as also has *erythema exudativum.* So far I have not met with these conditions. In *smallpox* a pustular eruption may appear in the pharynx. As to the appropriate *treatment* in these cases, general principles—cleanliness, and the treatment of symptoms as they arise—must serve as guides.

TONSILLITIS.

Although the tonsils are more or less involved in all cases of acute pharyngitis, yet clinical accuracy demands of every author that he should devote a separate section to this malady. In most cases of tonsillitis the pharynx is also involved, but this is usually secondary to the inflammation of the tonsil. For practical purposes we may divide inflammations of the tonsil into four classes, viz. :—

(1.) Superficial or catarrhal.

(2.) Lacunar inflammation, in which the inflammatory process has penetrated into the crypts.

(3.) Follicular, associated with ulceration of the follicles, deposits of fibrin, and often exudation, into the lacunæ (*see* septic sore throat).

(4.) Tonsillar and peritonsillar abscess.

As to the etiology of tonsillitis, opinions are much divided; and I strongly suspect that in future years we shall come to recognise the fact that the same disease may be produced by very different factors; and further, that what appears to be the same disease may have quite a different life history. I have little doubt that there is a very distinct connection between the rheumatic diathesis and certain forms of tonsillitis. I have equally little doubt that there is a very intimate connection between another form of tonsillitis (not at present distinguishable from the rheumatic form) and diphtheria. It is also probable that still another variety of the same complaint is an infectious disease *sui generis* as held by Fränkel and Seifert. Finally, we have already seen that a form of tonsillitis is very commonly associated with, and due to, exposure to septic influences. Probably any of these varieties may produce suppuration as a secondary result; but it has always seemed to me that the formation of pus, as it usually occurs in the peritonsillar tissues, is more often independent of inflammation of the tonsils, which is sufficient in intensity to produce a secondary phlegmon. If, when a case of tonsillitis occurs, there happens, as is not unusual in our cities, to be a prevalence of scarlatina, the etiology of the affection may be still further complicated. No doubt inflammation of the tonsils is more liable to occur during cold and wet weather; this applies both to the suppurative and non-suppurative forms. Whether any other diathesis, besides the rheumatic, plays an important part in the etiology of tonsillitis is doubtful. The disease occurs more commonly in young adults, but is seen both in children and in elderly people. The attack is often ascribed directly to a chill, while chronic enlargement of the tonsils seems to act as a predisposing cause. To recapitulate we may probably have—

(1.) A rheumatic tonsillitis.

(2.) A diphtheritic tonsillitis.

(3.) A contagious tonsillitis, possibly closely allied to the preceding.

(4.) A septic tonsillitis.

(5.) A suppurative peritonsillitis, or tonsillitis sometimes secondary to one of the preceding forms and sometimes primary.

The *symptoms* of tonsillitis are practically those of pharyngitis, with the exception that the pain is greater and referred to the side rather than to the centre of the throat. Chilliness, thirst, soreness of the back and limbs are soon followed by pain in the throat, most marked on swallowing. The temperature rises and may reach 104° or 105° very early in the disease, while the pulse is proportionately frequent, and in typical cases distinctly of the sthenic type. The tongue is furred, the breath often offensive, and there is in marked cases great difficulty in opening the mouth.

The *objective appearances* vary considerably. There may be only a general redness and swelling of the tonsils, palate, and fauces, in mild cases. Frequently, however, we see patches of exudation. According to Schech, these patches may consist simply of catarrhal products produced in and exuding from the crypts (lacunar), or they may result from suppuration of the lymph follicles (follicular)—as in septic pharyngitis. This certainly corresponds to clinical experience, for in some cases the exudation can easily be rubbed off, while in others it is closely adherent. As a rule, the virulence of the disease is spent in less than a week. Occasionally suppuration of the tonsil follows, and then relief is only obtained after spontaneous or artificial evacuation of the pus.

In *peritonsillar* abscess, so far as I have observed, the pain and tension are the prominent features, the general malaise and febrile movement being, as a rule, less marked. My experience of this affection has been considerable in out-patient hospital practice, and the sufferers have often admitted an inclination to eat, although the pain rendered deglutition impossible. In these cases, the palate in front of the tonsil is much bulged on one side and the diagnosis is usually easy.

Tonsillitis may attack one or both tonsils; but usually one is more affected than the other. Peritonsillar abscess is commonly unilateral.

In many cases the *diagnosis* is simple enough. Thus, in an adult predisposed, according to the history of the case, to attacks of quinsy, the occurrence of marked fever and inflammation of the tonsils, in the absence of epidemic diphtheria, probably means a simple repetition of an accustomed malady. In a child, however, the presence of patches on the tonsils, associated with fever, must arouse suspicions, especially if, as is too often the case in our cities, diphtheria be prevalent. When the exudation extends beyond the tonsils the more grave disease may be looked upon as present; but the converse is by no means true. It is often stated that in tonsillitis the exudation can always be easily rubbed off; my own experience contradicts this general assertion. Further, it is said that the patches are often discrete in simple tonsillitis; so they may be in an early stage of diphtheria. The non-occurrence of albumen in the urine is of more value, but this phenomenon may be absent in diphtheria. In both tonsillitis and diphtheria the glands about the angle of the jaw may be enlarged. The often more gradual onset of diphtheria, and the frequent accompaniment of a rapid and, at the same time, weak pulse, may be considered as important factors in diagnosis. The pain, too, is on the whole less marked in diphtheria. My friend, Dr. M'Leod, of Shanghai, tells me that he has observed the occurrence of typical tonsillitis in two members of a family followed by an attack of diphtheria in a third. His observations pointed in these instances either to a common etiological factor in all three patients, or—which is more probable, as they were not simultaneous but consecutive—to contagion.

The sore throat of scarlatina it is often impossible to distinguish from simple inflammation, but the characteristic eruption and the appearance of the strawberry tongue will facilitate diagnosis. Attention to pulse and temperature will prevent the mistaking of such conditions as tertiary syphilis, cancer, &c., for tonsillitis. On the other hand, the line of division between tonsillitis and the various forms of pharyngitis already described (*i.e.*, simple and septic forms) is so purely arbitrary that a differentiation is only justified on clinical grounds; and even this does not hold good for all cases.

The *prognosis* in simple tonsillitis is always favourable. Cases have been recorded in which death occurred from pus finding its way, after the bursting of an abscess, into the air passages. According to some authors paralysis of the palate may follow simple tonsillitis, but, in view of the difficulty of eliminating true diphtheria, these cases must be accepted with caution. There can be no doubt that tonsillitis is liable to recur, and this is especially true of the rheumatic form. Further, tonsillitis may be the precursor of an attack of acute rheumatism, and this possibility should always be remembered.

Even in the mildest cases it is well to begin *treatment* with guaiacum, provided the conclusion be come to that the case is one of simple tonsillitis only. This is best administered every few hours in the form of lozenges, in which the resin is combined with black currant paste (London Throat Hospital Pharmacopæia). In certain cases this drug seems to have almost the effect of a specific. Aconite in small doses is often recommended, but in rheumatic cases, *i.e.*, those in which there is considerable muscular and spinal pain, I think salicylate of sodium, 10-20 grs. every few hours, answers best. Capart and Gouguenheim have found that salol, in doses of 15 grs. four or five times daily, has a most remarkable influence in cutting short pain and reducing fever in acute tonsillitis and pharyngitis. Sucking ice, or the administration of iced barley water, to which some lemon and sugar have been added, will often be appreciated by the patient. In mild cases a gargle of solution of chlorate of potash (ʒ ii. ad ℥ viii.) may be employed, and permanganate of potassium may be used in the same way. In severe attacks, however, gargling is prevented by the painful condition of the parts.

The application of powdered bicarbonate of sodium to the inflamed tonsils has been much advocated by some authorities, and seems to have given satisfactory results.

The general health (bowels, &c.) must be attended to, the patient confined to bed, and bland unirritating diet prescribed. Deglutition is usually extremely painful, but may be rendered tolerable by brushing or spraying the throat with a 10 p.c. sol. of cocain. Menthol (20 p.c. in olive oil) is often serviceable. Its anæsthetic action is not so marked as that of cocain, but, on the other hand, its antiseptic properties are valuable. In those cases which are suspected to be of septic origin I should certainly recommend its employment. The oleaginous solution may be applied by means of a brush or as a spray (the De Vilbiss instrument being employed). A solution of boroglyceride (1-5 in glycerine), or Condy's fluid, may also be used as pigments.

If it be suspected that suppuration is imminent, it is well to steam the throat and apply warm poultices to the neck and angle of the jaw. In certain cases (peritonsillitis) a distinct bulging of the palate in front of the tonsil indicates the probable presence of pus in this, its favourite, situation. To press upon this tender, swollen part with the fingers of one hand, while those of the other are applied behind the angle of the jaw—a practice recommended by Stoerk to diagnose fluctuation—I consider as an infliction of needless pain. When the probability exists that matter either has or will be formed, it is better to make an incision a little outside of, and parallel to, the anterior pillar. Whether or not pus be evacuated, the depletion so produced tends to diminish pain. Sometimes, although the symptoms indicate suppuration, it is not quite apparent where the pus is situated. In such cases I incise first in the position indicated, and then the most prominent part of the tonsil proper. Occasionally it happens that the connective tissue behind the tonsil contains pus. In such cases it seems to me safer—unless a prominent bulging towards the middle line exists—to abstain from an exploratory incision. Besides, the presence of pus in this situation may be masked by the tonsil being forced inwards, and perhaps forwards. Cocain may be applied before an incision is made, but it must be remembered that the bleeding—which so often helps to relieve tension—is liable to be checked by the well known power of contracting vessels possessed by this drug. The most suitable instrument for making such incisions is Mackenzie's pharyngeal bistoury, although an ordinary curved, pointed bistoury will serve the purpose. It must be borne in mind that patients who are the victims of suppuration in the neighbourhood of the tonsils are often unable to afford the operator much assistance, owing to the intense pain produced by attempting to open the mouth. The operation must therefore occasionally be undertaken almost in the dark, and a good light and a laryngeal reflector are then essentials. In view of the great probability that certain forms of tonsillitis are contagious, it is well to isolate the patient where practicable; however, each practitioner must judge for himself in this question, which may still be said to be *sub judice.*

Tonsillitis is, as has been stated, liable to recur in the same individual, and therefore the question of prophylaxis is of considerable importance. It must further be remembered that the rheumatic variety is often directly due to exposure to cold; so that in those who are subject to attacks, great care should be exercised in order to avoid chills. After the patient has recovered, it will usually be found that the tonsils are either in a chronic state of congestion or considerably enlarged. I have known the continued use of a solution of iodine, applied with a brush, stop the tendency to sore throat (℞. Iodi gr. vi.; Potass. Iodid. gr. xii.; Ol. Menth. Pip. min. v.; Glycerin. ad ℥i). If the tonsils be much enlarged it is probably better to remove a portion with the guillotine. When, however, there is no very great increase of size, I believe that the best treatment is to apply a flat burner, heated by electricity, to the whole surface of the tonsils. This operation is, if cocain be used, hardly at all painful, and often very successful. The *rationale* of the treatment is to be found in the production of cicatricial tissue in place of the hitherto tender mucosa. So far as I have employed this method it has usually succeeded, but I hardly think that a satisfactory result can ever be guaranteed. According to Hoffmann, tonsillitis is often due to an accumulation of decomposing matter in the crypts, and he therefore advises the employment of a blunt hook to break down the divisions between the lacunæ, and in cases where this instrument is not successful, he even uses scissors. When septic influences are suspected, the drains of the house in which the patient resides must be carefully examined.

RETRO-PHARYNGEAL ABSCESS.

This is a somewhat rare affection, and may be either idiopathic or secondary.

The idiopathic variety is most common in very young children, and it is now generally believed that it is due to a lymphadenitis affecting glands, which, according to Henle, are of considerable size in infancy, and usually disappear at, or after, the fifth year of life. These glands are situated at the level of the second and third cervical vertebræ. It is not improbable that some peripheral irritation, such as eczema or nasal catarrh, may be the initial cause of the glandular inflammation. Retro-pharyngeal abscess also occasionally occurs during the course of scarlatina; and in most cases the strumous diathesis forms a predisposing cause.

Retro-pharyngeal abscess may result from injury, the presence of a foreign body, and even from burrowing of pus, due to neglected otitis; but the most common cause of secondary abscess is, undoubtedly, disease of the cervical vertebræ.

It follows, from what has been said, that the affection may develop suddenly or gradually, according to its etiology. High fever, with marked pain, may be present; but again, the whole course of the disease may be chronic. Interference with deglutition and respiration are the most common and constant phenomena. Any young child presenting these symptoms should be carefully examined for retro-pharyngeal abscess.

On examination the posterior wall of the pharynx is seen to be bulged, but in the case of young children, where the real difficulties in diagnosis occur, inspection is likely to be unsatisfactory. Palpation by means of the index finger will usually, however, detect fluctuation. In most cases the parts about the angle of the jaw are more or less infiltrated, and stiffness of the neck is marked. In older children or adults, of course, laryngoscopy may be employed to aid in detecting the exact nature of the case.

The *prognosis* varies according to the cause; in idiopathic cases, and, if the patient be not an extremely young infant, the chance of cure is good.

As to *treatment*, the chief indication is to evacuate the pus. Should the idiopathic form be detected in its initial stage of phlegmon applications of iodine may be made by means of a brush. The patient is usually too young to admit of sucking ice. If actual fluctuation be present, no time should be lost in allowing the pus to escape. The abscess may be opened by means of a trocar or a guarded knife. Whichever method be employed, the head should be thrown forward the moment the opening is made. Hilton, and after him Chiene, recommended that the same result should be attained by means of an external opening behind the sterno-mastoid muscle. If this method be employed the strictest antiseptic precautions can be carried out. No doubt this would be of immense importance in secondary pharyngeal abscesses connected with cervical caries.

CHAPTER IV.

CHRONIC INFLAMMATIONS.

CHRONIC PHARYNGITIS.

As to the etiology of this affection it is difficult to speak with certainty. In my own experience the causes commonly mentioned in text books, viz., scrofula, syphilis, tubercle, &c., have been usually conspicuous by their absence. On the other hand the arthritic diathesis, especially the gouty form, is a common factor. Among the more immediate causes of the affection are (1) repeated attacks of acute pharyngitis; (2) the constant use of alcohol, tobacco, and irritating articles of food, *e.g.*, condiments; (3) excessive use of the voice; (4) exposure during a greater part of the day to fine dust or irritating particles.

From a clinical point of view chronic pharyngitis may be divided into three varieties:—

(1.) Simple chronic catarrhal pharyngitis.
(2.) Hypertrophic pharyngitis.
(3.) Atrophic pharyngitis.

Simple Catarrhal Pharyngitis.—This variety is characterised by congestion and more or less swelling, affecting chiefly the uvula and soft palate. The patient feels his throat uncomfortable, especially in the morning, and has a constant inclination to clear it. This form is usually either the result of dietetic indiscretions or repeated colds. Most persons who smoke much are affected, to some extent, by congestion of the soft palate and uvula. The latter, in this form of pharyngitis, is more or less thickened and elongated, but I have not met with many cases in which its extremity seemed to irritate either the base of the tongue or the epiglottis.

The *treatment* of this condition should be comparatively simple. Errors in diet and hygiene should be detected and remedied, while a teaspoonful of Carlsbad salt taken in a tumbler of hot water before breakfast as an aperient is often useful. The parts chiefly affected being within reach of gargles, one containing chlorate of potassium and alum (āā ʒii. ad. ℥viii.) will be found beneficial. A gargle of salt and water used every morning is also useful. If further treatment be required, the use of astringent pigments, such as perchloride of iron (ʒi.), chloride of zinc (gr. xxx.), nitrate of silver (gr. xx. ad. ℥i.), or glycerine of tannin may be desirable; it must, however, be remembered that the silver salt ought not to be continued for an indefinite time, lest staining of the skin should result. Iodine in solution with glycerine may also be employed (iod. gr. vi., potass. iodid. gr. xx., ol. menth. pip. min. v., glyc. ad. ℥i.). If necessary, and if this application—known as Mandl's solution—be well tolerated, the quantity of iodine may be increased up to grs. xii., or even more, with, of course, a proportionate addition of the iodide of potassium, which holds it in solution. Lozenges are much recommended in England, and no doubt they are beneficial, so far as local effect goes; but I cannot but doubt whether it is good for the victims of chronic pharyngitis to swallow quantities of astringent drugs administered in this way. Of lozenges, the most serviceable locally, and probably the least objectionable on general grounds, are the Trochisci Krameriæ of the London Throat Hospital Pharmacopœia.

If it be definitely determined that the uvula is so elongated as to produce the feeling of a foreign body, and to lead to constant voluntary cough, then a portion of this organ may be amputated. This little operation can be best performed by grasping the tip of the uvula with dressing forceps, and then cutting it off with blunt, pointed, curved scissors, used so that the raw surface produced is on the posterior aspect. Cocain should be applied first, and ice sucked afterwards to prevent reaction, while the diet must, for a day or two, be cool, bland

and soft. I have laid some stress upon the necessity for first establishing the indications for operation, as by no means every enlarged uvula requires amputation, and a patient has a very substantial grievance to complain of if, after submitting to a somewhat painful proceeding—followed, perhaps, by a sharp sore throat—he finds himself after all no better.

This form of catarrh is, I believe, present in many persons during a lifetime, and does not require treatment unless it produces unpleasant symptoms.

Hypertrophic Pharyngitis (*Synonyms: Granular Pharyngitis, Lateral Pharyngitis, Clergyman's Sore Throat*).—This is a very important subject, and is perhaps more difficult to treat in a text-book than any other. Of course, it is very simple to define as hypertrophic pharyngitis a form of inflammation resulting in more or less enlargement of such parts as the tonsils and lateral folds, or the lymph follicles, on the posterior wall. It is the frequent presence of this last-named condition which has led to the designation granular pharyngitis, so commonly applied to this affection. Hypertrophic pharyngitis is often found in clergymen and others who use their voice in the exercise of their profession; hence the designation, "clergymen's sore throat." The rheumatic, and especially the gouty dyscrasia, have been rightly considered as predisposing causes.

Contrary to the method so far adopted, I shall describe first the *objective appearances* which may be met with. In some patients there is little or no general congestion of the pharynx, but here and there on its surface, more particularly on the posterior wall, are seen reddish granules, varying in size, but rarely exceeding the bulk of a split pea. In others, the whole surface is red and congested, covered more or less with red elevations, which sometimes form ridges. Then again, the tonsils may be slightly enlarged; and behind them—especially during the act of retching—may be seen thickened red bands (*hypertrophy of the lateral bands, or lateral pharyngitis.*)

The condition of parts just described is usually found in adults. In childhood we often see granules on the posterior wall of the pharynx, but so far as my experience goes, these are, on careful examination, almost universally found associated with adenoid vegetations of the naso-pharynx. With hypertrophy of the tonsils, which presents important clinical differences from hypertrophic pharyngitis (although in the latter the tonsils are often enlarged to a moderate extent), we shall deal in a later portion of this chapter.

The reader may fairly ask, What are the symptoms caused by the objective changes above detailed? and it is in attempting to answer this question that obstacles present themselves.

The *symptoms* usually complained of by patients are discomfort in the pharynx, or, not uncommonly, a frequent inclination to clear the throat. There may be considerable hypersecretion, which leads to this inclination; or, on the other hand, the patient may have the feeling of a foreign body in the throat, and keep trying to get rid of it. A sensation of heat, slight soreness, and even some little pain on deglutition, may be experienced. Great dysphagia is described by some authors, but so far I have not noticed it in connection with hypertrophic pharyngitis. Cough, apart from voluntary clearing of the throat, may be excited by chronic changes in the pharynx, and asthma has been cured by the destruction of granules situated upon the posterior wall. If the naso-pharynx be implicated in the hypertrophic process, hearing may be more or less affected.

The *symptom par excellence*, however, and the one for which advice is usually sought, is loss of voice. The patient in these cases is usually one who requires to employ his vocal organs in the exercise of his calling—be it preaching, acting, or singing.

At first the voice is easily fatigued, and its use is sometimes followed by aching of the neck. In many persons who make these complaints examination of the larynx shows no abnormality, while in others there is evidence of more or less chronic laryngitis. It has seemed to me that the redness of the vocal cords is, in these cases, often confined to the posterior portions (*i.e.*, the region of the vocal processes).

According to my experience, the symptoms of granular pharyngitis are invariably most marked when the patient's general condition is below par, be the cause dyspepsia (a common complication) anæmia, or simply overwork.

I do not think that the connection between the objective changes and the symptom which is most prominent, viz., interference with the voice, has yet been satisfactorily explained. If the hypertrophy of the lateral folds be very marked it is quite comprehensible that in this way the movements of the palate are impeded. If, again, the whole posterior wall of the pharynx be covered by protruding masses, then the explanation proposed by Michel may hold good. He believes that the inequalities of the pharyngeal wall render it less fit to act as a resonating chamber, and thus increased effort is required during voice production. It must, however, be well known to all aurists who are in the habit of examining the throat in those who do not complain of throat symptoms, that very marked evidence of hypertrophic pharyngitis may exist without any of the subjective sensations usually attributed to it. It is also within the almost daily experience of laryngologists that the discomfort produced is by no means always in proportion to the visible deviations from the normal. In a certain number of cases I believe the granules, owing to their being more liable to irritation than the surrounding tissue, act as foci of inflammation, and thus by their presence produce a tendency to congestion. In other instances, however, where the subjective symptoms vary, not in proportion to changes in the objective condition of the throat, but with variations in the state of the patient's general health, it is difficult to prove that the hypertrophic pharyngitis has as much to do with the production of the symptoms as it is the common custom of writers to attribute to it. It is difficult to avoid the conclusion, that, while in certain cases of hypertrophic pharyngitis, either the changes are so marked as to be inconsistent with perfect comfort, or the granules act as foci of congestion, giving rise on the slightest irritation to subacute inflammation of the pharynx, yet in quite a number of instances the connection between objective changes and symptoms—if, indeed, connection there be—must be purely nervous. This was recognised by Solis Cohen in his admirable work on *Diseases of the Throat* (first edition, 1872). In most text-books, however, it is either directly stated or implied that if a patient who uses his voice much suffers from vocal weakness, and if objective examination of the throat reveals some granular pharyngitis and a healthy larynx, the symptom is due to the pharyngeal condition. This position is, however, illogical, for it is perfectly well known (1) that we may have a neurosis of the larynx, corresponding in all respects to writers' cramp; and (2) that a very large number of persons have hypertrophic pharyngitis without any symptoms worthy of mention. But if we may have a condition of the larynx analogous to writers' cramp, it is probable (without stretching the analogy too much) that we may have a hoarseness from over-fatigue of the vocal muscles. The persons who suffer from the vocal disability commonly attributed to hypertrophic pharyngitis, are usually those who employ their voices in earning their daily bread, and hence it seems difficult to exclude a neurosis. I may be met here with the statement that in many such cases cauterisation of the hypertrophied areas effects a cure. Where this hypertrophy is very marked I am quite willing to admit its importance as a factor of dysphonia; but I would also remind the reader that rest of the voice is almost invariably enjoined in addition to active treatment. Further, it is by no means impossible that cauterisation of the pharynx may have a powerful reflex stimulating effect upon the larynx.

The *treatment* of chronic hypertrophic pharyngitis must be energetic, exactly in proportion to the amount of inconvenience it gives rise to.

At first the general health should be attended to. Anæmia, if present, must be combated with iron, arsenic, and fresh air, any existing uterine irregularity should receive attention. Gouty subjects should be directed as to their diet and regimen, and, if necessary, be treated with Carlsbad water, &c. Want of exercise and fresh air, associated perhaps with good living, an after-dinner cigar smoked indoors, the free use of condiments, and sometimes of alcohol, form a combination, each individual item of which is injurious. Dyspepsia, too, must be treated if it exists—as it often does in these cases. Solis Cohen speaks highly of Horsford's acid phosphate liquor as a tonic in granular pharyngitis. He advises that a teaspoonful should be taken several times a day in a large goblet of water. At the same time local medication must not be neglected. The iodine pigment (described in the preceding section) has been found extremely useful in these cases. Nitrate of silver, also applied with a brush in solutions of 40 grs. or more to the ounce may, however, in some cases, answer better. Quite recently Weil has advocated the employment of crude pyroligneous acid. Of this remedy I can only say that it is well tolerated and efficient. As to its relative efficiency (*i.e.*, compared with other applications), I cannot, however, yet definitely express an opinion. Among other astringents which may be employed, perchloride of iron (ʒi. ad ℥i.), chloride of zinc (gr. 30 ad ℥i.), and glycerine of tannin, may be mentioned. If dryness or discomfort in the throat be much complained of, a pigment composed of tannin (gr. xxx.), carbolic acid (gr. xxx.), and glycerine (℥i.), may be employed. Now, so far, the patient can carry out the treatment perfectly well without medical aid—if he be gifted with ordinary intelligence. Often it is well to continue this local treatment, with a change of air, so that even if further and more active measures have to be resorted to eventually, milder means may have every chance. It is further, of course, imperative that the air breathed, the food eaten, and the life led, should tend as little as possible to irritate the throat. To prohibit smoking, especially indoors, late hours, condiments, strong wines and spirits is advisable. It is the fashion of many specialists to run down watering-places in the treatment of chronic pharyngitis. There are, no doubt, certain cases in which the changes in the pharynx are so marked as to account entirely for all the symptoms, and in which the more active treatment, presently to be described, may be commenced at once. In the doubtful cases, however, in which it is uncertain whether the subjective sensations are due to nervous exhaustion or local changes in the pharynx, it appears to me that a complete change of scene and surroundings, with perfect rest, may do much good. Further, it is certain that such resorts—to name only a few—as Ems, Eaux Bonnes, Mont Dore, Aix-les-Bains, have a beneficial action in chronic pharyngitis. While, therefore, I would never order a poor patient to put himself to the expense of a course at one of these mineral springs, yet the rich man, who is able to do so without inconvenience, may considerably benefit by his residence at such a health resort.

In cases where the voice is much affected, it is of considerable consequence to make the patient rest his vocal organ. If this be—as, unfortunately, it too often is—impracticable, care must be taken to make the process as little fatiguing for the larynx as possible. Clergymen, in speaking from the pulpit, are often inclined to phonate while the head is bent forwards and downwards. As pointed out by Whipham, this habit should be corrected, and the patient directed to speak with the head well thrown back. In addition to this, the vocal cords should be as much relieved as possible, by making the lips, tongue, and palate fulfil their functions in phonation, as pointed out by Michel. This author has suggested a system which consists in exaggerating the movements of these parts in phonation. Every intelligent person can analyse for himself the part played by these various organs in voice production, and by a little practice can enable them to fulfil their function more thoroughly. Michel's system consists in making the patient go over the alphabet, accentuating the motions of the lips, tongue, and palate in the pronunciation of each letter, and after a certain amount of proficiency has been acquired, directing him to practice reading or speaking, holding a small piece of cork between the teeth. Breathing, too, must of course be carefully regulated, and all hurried respiration avoided.

If in spite of all these remedies no result be obtained, more active measures must be resorted to. These consist in destroying the hypertrophied tissues, and for this purpose either chromic acid, fused on a rough silver probe, or the electric cautery is most serviceable. Their employment should, of course, be preceded by brushing the pharynx with a 20 p.c. solution of cocain. If chromic acid be used, the caustic is applied either to the enlarged lateral folds or granules, and after a minute or so the patient is directed to gargle with a solution of bicarbonate of soda, and at the same time to swallow a little of the fluid. It is always well to avoid cauterising too large a surface at one sitting, otherwise nausea and malaise may result from the toxic action of the caustic. The galvanic cautery is, however, much more convenient. A somewhat flat burner is applied to each granule and, if necessary, also to the lateral folds, which are best brought into view when the patient is inclined to retch. If the tonsils be at all enlarged, the flat burner may also be applied to them, care being taken, however, to avoid injuring the pillars of the fauces. It is desirable not to cauterise too large a surface at one sitting, and further, to wait until the sloughs have fallen off before a second operation. The time required for this varies from a few days to a fortnight. After the operation it is well to make the patient use a gargle containing boracic acid, and paint or spray the part several times a day with a solution of menthol in olive oil (20 p.c.), which acts both as an anæsthetic and antiseptic; menthol may also be employed in the form of pastilles (gr. ¼ in each).

What has been said as to amputation of the uvula in the preceding section applies in every respect to the condition under consideration.

In all persons who have delicate throats the use of a salt and water gargle morning and evening seems to act beneficially, while during sub-acute exacerbations the chloride of ammonium inhaler may be employed. Sucking chlorate of potassium tablets is agreeable to some patients, while Krameria lozenges, owing to their astringent action, are often prescribed. Coca is said to have a bracing effect upon the laryngeal muscles, and may be taken either as lozenges, or in the more palatable Vin Mariani de Coca if a temporary vocal stimulant be required, although the habitual employment of this drug must be discountenanced. I have recently used menthol pastilles (gr. ¼ in each), of which my patients have spoken highly as "voice lozenges." Eucalyptus and pumiline lozenges are also often employed.

Pharyngitis sicca.—Pharyngitis sicca is characterised by a tendency to atrophy of the mucous membrane, which is at the same time seen to be covered by a thin film of dried exudation. This condition is often associated with the formation of crusts in the naso-pharynx, but may exist *per se.* The actual etiology of the affection is still undecided. In certain cases, at all events, it is probable that a hypertrophic process precedes the atrophy, and leads to it by subsequent cirrhotic changes in the infiltrated tissues. Not only does the atrophy attack the mucosa, but the mucous glands are also involved, and their secretion seems to dry up as soon as it is thrown off. According to Schech, pharyngitis sicca is not uncommonly associated with Bright's disease and diabetes. He therefore recommends that the urine be tested in all such cases.

Fortunately the *symptoms* of pharyngitis sicca are almost all summed up in dryness of the throat, with occasionally the feeling of a foreign body.

Treatment must be directed to the relief of the leading symptom, for it is obviously impossible to restore atrophied structures.

The vapour of creasote (creasote min. 80; magnes. lev. gr. 40, aq., ad ℥i., a teaspoonful to a pint of water at 140° for each inhalation) of the London Throat Hospital Pharmacopœia, has seemed to me one of the best methods of relieving the discomfort. Painting with iodised glycerine (*see* preceding section), with glycerine of carbolic acid (grs. xxx., ad ℥i.), and even with a mixture of glycerine and tincture of capsicum have also proved useful.

CHRONIC INFLAMMATION OF THE TONSILS.

As has been already stated, the tonsils may be more or less enlarged in chronic pharyngitis. Sometimes the enlargement is slight and does not interfere with health at all. Not uncommonly the crypts of the tonsils from time to time fill with cheesy matter which, when removed, has a most offensive odour, and the physician's advice is sought for on this account. Very marked hypertrophy is commonly only found in children and young persons, as there seems to be a natural tendency for the enlarged glands to diminish after twenty-five.

The *symptoms* most commonly met with in these cases are—(1) interference with the voice owing to impeded movement of the palate; (2) interference with respiration through the mouth. When nasal respiration is much interfered with, and when deafness, due to obstruction of the Eustachian tubes, is also present, I have generally found that the adenoid tissue in the naso-pharynx, is also hypertrophied. Deglutition is sometimes uncomfortable, but rarely painful, unless during a subacute exacerbation.

Interference with respiration, due to enlarged tonsils, is said to cause a tendency to pigeon breast, and asthma has been relieved by the removal of the enlarged glands. In chronic tonsillar inflammation, examination reveals one or more of the following conditions, and the chronic nature of the affection is shown by the absence of fever and pain, together with the history:—

(1.) On the surface of the tonsil are seen one or more white spots. If pressure be made in their vicinity, yellowish offensive pellets are extruded. It may be here mentioned that occasionally these concretions are so altered in character as to assume the physical characters of *calculi.* Pain and subsequent suppuration may, of course, then result, and the hard mass is thrown off. The presence of such a calculus may, however, only be detected on attempting to excise the enlarged gland.

We sometimes meet with, in and near the tonsil, a pale yellow mass, evidently covered with mucous membrane. On incising this and making pressure, a cheesy nodule, or creamy liquid, is extruded. This condition results from the retention of the secretion within a crypt. In two cases of this kind occurring in my practice incision gave rise to the escape of about a drachm of cream-like fluid, and it seemed doubtful whether the cases should be classed as cysts or chronic abscesses.

(2.) Enlargement of one, but more commonly both tonsils, may exist, so that in extreme cases they meet in or about the middle line. It is, however, by no means uncommon to have the glands enlarged in an antero-posterior direction, so that comparatively slight protrusion inwards is noticeable.

A few cases are on record in which there remained, after acute inflammation, a chronic abscess of the tonsil. Should the practitioner meet with such a case, he will probably have little difficulty in arriving at a correct diagnosis after careful examination.

The *diagnosis* of enlarged tonsils is so simple that we need not further dilate upon this subject.

The *treatment* of chronic inflammation of the tonsils should be energetic, exactly in proportion to the inconvenience caused. I do not think that local applications are often followed by much result; but the most rational on theoretical grounds, as well as the most serviceable as regards clinical experience, is the iodine pigment before mentioned in connection with pharyngitis. The treatment of cheesy accumulations in the crypts without marked enlargement is often troublesome. I have found that directing the patient to extract the mass by pressure so soon as it is formed, and at the same time to check any existing pharyngeal catarrh by suitable applications and regimen, is often useful. To this line of treatment may be added the introduction of a bead of nitrate of silver, fused on a rough probe, after the cheesy mass has been pressed out. Hoffmann's method, too, may be employed to break down the partitions between the crypts, and admit of free draining of the secretions. If the exudation be covered, as it sometimes is, by mucous membrane, this must be incised and the contents squeezed out. When the quantity of retained secretion is very considerable the outer wall of the cavity should be removed.

If the tonsils be so large as to necessitate reduction, this may be accomplished either by means of the bistoury, guillotine, or electric cautery. Before all these operations I now use a strong solution of cocain. At first I feared that owing to the contraction of the vessels produced by this drug, dilatation, followed by secondary hæmorrhage, might occur after its employment in cutting operations; but experience has not justified my fears.

In cases where the tonsils project well towards the middle line as circumscribed tumours, the guillotine is certainly the best instrument. As quite a number of different varieties exist, it may be well to state that I consider the instrument recently devised by Reiner to be infinitely superior to all other forms. In using it care must be taken to introduce the fork well into the tonsil when the ring has encircled it, after which the blade should be pressed home. The gland is lifted from its bed by the fork, which drags it more and more towards the middle line as the knife is brought into action. It is well to have at least two sizes of this instrument. The other form of guillotine commonly employed is that known as Mackenzie's, but the advantages of that already described are so great that those who have employed it once are unlikely to try any other form.

Some hypertrophied tonsils cannot, however, be encircled by the ring of a guillotine, owing to antero-posterior enlargement. In such cases they may be amputated, by first pulling the gland forcibly towards the middle line, and then cutting off as much as possible with a probe-pointed bistoury. This operation is safe enough, if the knife be not allowed to cut further outwards than the anterior pillar of the fauces, and if care be taken not to wound the tongue. A probe-pointed curved bistoury, with a cutting surface at its extremity of about an inch and a half in length, is a very convenient knife for the purpose.

Unmanageable children sometimes require chloroform for this operation. A gag associated with a tongue-depressor must then be employed, and the operation performed while the throat is well illumined, either by direct or reflected light.

Dangerous bleeding rarely follows tonsillotomy, and this accident is particularly uncommon in childhood. It may, of course, occur in those of the hæmorrhagic diathesis, and it occasionally follows the removal of very dense fibrous glands, where the fibroid change interferes with the retraction of cut vessels. So far I have fortunately not met with an example of dangerous bleeding. The remedies I should be most inclined to rely upon, however, are—(1) the electric or actual cautery; (2) digital pressure, or, if it be preferred, a pad applied by a special apparatus; (3) ligature of the stump after pulling it out; (4) making the patient stand up until syncope comes on, as recommended by Fuller. It is very doubtful whether a sane and sensible operator can ever cut the internal carotid, even with a bistoury, in excising tonsils, and the bleeding is probably always from small vessels, either in the tonsil or anterior faucial pillar.

Reduction of enlarged tonsils by the electric or Paquelin cautery may also be employed. A flat burner is applied over the tonsil, and the tissue thus destroyed. If the gland be very large several sittings are required, the interval between them being sufficient to allow the eschar of the previous operation to fall off. While separation of the slough is going on, painting with menthol solution is useful, both as an analgesic and antiseptic. Gargling with a solution of boracic acid is also to be recommended.

The galvano-caustic snare is advocated by some authorities as a substitute for the guillotine; but the only justification for its use is that dangerous hæmorrhage is thus avoided, and we have seen that this is an extremely rare contingency.

Hoffmann's method, as already described, *i.e.*, breaking down the tonsil by means of a blunt hook introduced into the crypts, has also been used by Mr. Miller, Edinburgh, with considerable success, as a means of reducing the size of the glands.

Let us now briefly recapitulate the indications for the operative treatment of enlarged tonsils.

(1.) *Tonsils so enlarged as to impede speech and respiration.*

(2.) *Marked enlargement, associated with Eustachian catarrh,* which has proved unusually obstinate. If adenoid vegetations exist, these should be first removed.

(3.) *Repeated attacks of tonsillitis.* If the tonsils be not very large, the galvano-caustic treatment is probably better than cutting operations.

After any operation, it is well to make the patient keep quiet, take bland unirritating diet, and above all avoid any septic contagion.

In *chronic abscess* of the tonsil, free incision, followed if necessary by the application of iodine to the abscess cavity is indicated.

CHAPTER V.

CHRONIC INFECTIVE DISEASES.

SYPHILIS.

Primary syphilis of the throat is fortunately a rare occurrence in this country, and into the causes which may produce chancres of the tonsils and adjacent parts we need not here enter. The appearance of a hard sore, and swelling of the lymphatics at the angle of the jaw, followed by a secondary eruption, characterise the disease.

During the *secondary* period pharyngeal syphilis may manifest itself, either as a *simple erythema,* or by the presence of *mucous patches.*

Syphilitic erythema gives rise to some discomfort of the throat, and on inspection the redness is seen to be more or less symmetrical and sharply defined, but this is by no means pathognomonic. *Mucous patches* are, when they occur, quite characteristic of syphilis, and appear as bluish-white elevations of the mucous membrane, their favourite location being on the tonsils and soft palate. There is little difficulty in diagnosing this condition when marked, but sometimes the only evidence of the presence of syphilis is a bluish-grey clouding of the epithelium in a patient who complains of sore throat. In cases where this bluish-grey tint is observed, the possibility—nay, probability—of its syphilitic origin should never be lost sight of. The *subjective symptoms* vary in different individuals, from those of slight discomfort to distinct sore throat. It must be remembered that mucous patches may occur years after the initial lesion, although they are commonly indicative of secondary syphilis.

Occasionally one meets with marked ulceration quite early in syphilis. The ulcers are then more or less superficial, and do not tend to the same rapid destruction of tissue which is so common in the tertiary variety.

In tertiary syphilis the disease may manifest itself as (1) a gummatous tumour of the soft parts; (2) periostitis, involving the posterior wall, where it is formed by the bodies of the cervical vertebræ; (3) ulcers.

Gummatous infiltrations of the soft parts may be either nodular or diffuse, and usually tend to break down with considerable rapidity. Sometimes, however, this process is delayed and the tumour appears on the soft palate or posterior wall as a distinct swelling, which eventually breaks down; before this process, however, actually leads to discharge, the swelling shows one or more points having a yellow tinge.

Periostitis of the posterior wall may lead to the development of a hard osseous projection, somewhat tender to the touch, but otherwise having the appearance and characteristics of an exostosis. In the only case of this kind I have met with, there was tenderness on pressure over the cervical vertebræ behind, but no irregularity; there was also one spot which was extremely sensitive when cotton wool wrung out of hot water was applied. In this instance, the affection so strongly simulated strumous disease of the spine that this diagnosis was actually arrived at by a very eminent surgical authority. Iodide of potassium, however, effected a rapid cure.

Ulceration is the form of advanced specific disease which usually presents itself. I do not think that we can dogmatise as to the characteristics of specific ulcers. The practitioner will not go far wrong if he suspects syphilis in every patient who shows marked ulceration of the pharynx, when the floor of the ulcer is covered with a dirty slough and surrounded by swollen, red mucous membrane. In tubercular patients, of course, there may be phthisical ulceration, the characters of which we shall presently discuss. Malignant disease of the tonsils, too, may give rise to great difficulty in diagnosis if ulceration has begun. At the same time it must be borne in mind that while tubercle and malignant ulceration of the pharynx are rare, tertiary syphilis is unfortunately too common in most clinics.

These syphilitic ulcers may appear in various forms:—

(1.) As deep ulcers, situated on the soft palate, tonsils, or other parts, surrounded by red, swollen, infiltrated tissue. When the palate is attacked the uvula is often œdematous, and the whole appearance is like that of an acute sore throat. These cases are sometimes seen just when perforation is about to occur, and the site of the future loss of substance is then marked by a yellow point. When a tonsil is attacked, the disease may simulate to the careless observer an acute tonsillitis. More or less pain may be occasioned, but the history and general condition of the patient usually clear up the diagnosis.

(2.) The soft palate may have numerous ulcers which tend to a more or less serpiginous arrangement. These, however, do not perforate, although they give rise to a peculiar worm-eaten appearance, which when once seen is not easily forgotten.

(3.) Occasionally one meets with single ulcers of the posterior wall, which tend to spread rather in breadth than depth, while the ashy grey floor gives rise to an appearance which is not unlike diphtheria.

The first variety described is the form most commonly met with, and if the process be not checked by suitable medication, caries and necrosis may result. In this way disease of the cervical vertebræ, exfoliation of the palate bones, &c., may occur. Deep syphilitic ulcers when they heal are almost certain to leave very marked changes in the pharynx. Sometimes a permanent perforation of the palate, with nasal speech, and ejection of food through the nose on deglutition remain. Again, a common result is adhesion of the soft palate to the posterior wall of the pharynx, resulting in a more or less complete severance of the pharynx proper from the naso-pharynx. As a result of this, speech, smell, and nasal respiration are interfered with; while, not uncommonly, deafness, from associated Eustachian obstruction, is also marked. Occasionally the healing of ulcers occasions constriction of the pharynx, so that deglutition and even respiration are rendered difficult.

The presence of marked scars in the pharynx, or perforation of the palate, may be considered as strong evidence of syphilis. It must, however, be remembered that tertiary syphilis may be the result of past indiscretions, either on the part of the individual or of his parents—that is, it may be either contracted or hereditary. Deep destructive ulcers may thus occur before the age of puberty, and it must not be forgotten that manifestations of hereditary syphilis may occasionally be delayed until adult life.

One other warning is required. It occasionally happens that whether owing to antecedent tonsillitis or as a congenital malformation, the anterior pillar of the fauces is perforated by a small orifice, and it would be a grave mistake to attribute this condition to the specific dyscrasia.

The *diagnosis* of syphilis of the throat is founded on (1) the history; (2) evidences of the disease in other parts; (3) in the case of mucous patches and characteristic ulcers, on the objective appearances. The differentiation of syphilis from tuberculosis on the one hand, and cancer on the other, must be made by a consideration of the special characters of these diseases. Syphilitic ulceration is common, while carcinoma and phthisis of the pharynx are rare. In cases of malignant disease where ulceration has already begun, it may be necessary to watch the effect of anti-syphilitic treatment, or to remove a portion for microscopic examination before a definite diagnosis can be arrived at.

The *treatment* of syphilis of the throat does not materially differ from that of the same disease in other parts. In the early manifestations mercury in some form should be administered. Inunction with mercurial ointment, or the internal administration of perchloride of mercury will often be found sufficient to cause disappearance of syphilitic erythema or mucous patches. Smoking and irritating food or drink must also be avoided. If the plaques should prove obstinate, they may be painted with chromic acid (gr. x., ad ℥ i.) or treated with solid nitrate of silver.

Tertiary manifestations usually yield to iodide of potassium when given in doses of from 10-15 grains thrice daily. At the same time, if this remedy does not act with sufficient celerity, mercurial inunction may be also employed, while the ulcers are treated with nitrate of silver or sulphate of copper.

When large defects are left in the palate a dentist may, by adapting to the mouth a suitable plate, to a certain extent overcome the difficulties of deglutition and phonation.

In cases where complete separation of the pharynx from the naso-pharynx has occurred as a result of cicatrisation attempts may be made to restore the air passage by passing a bougie through the nose and then cutting down upon the instrument. After this the orifice so produced is kept open by means of gradual and methodical dilatation. The tendency to contraction is, however, very great in these cases. When stenosis of the lower portion of the pharynx interferes with deglutition and even respiration, an attempt must be made, either by gradual dilatation or operation, to restore the lumen.

TUBERCLE.

By some authors a strumous ulceration of the pharynx is described, but it seems to me questionable whether there exist sufficient data for its differentiation. So far, putting aside tubercular and lupoid ulceration, I have not seen a case in which syphilis could be excluded.

Tubercular ulceration of the pharynx is, however, met with, although it is far from common. Isambert and B. Fränkel are the authorities to whom we are indebted for calling attention to the salient features of this disease. As a rule those who are attacked by it already suffer from more or less marked evidence of tuberculosis; although, as in a case recorded by Schech, the virus may have been dormant for years, and afterwards attack the pharynx. According to B. Fränkel the ulcers are lenticular in shape, and extend in superficial area rather than in depth, while in the neighbourhood are seen tubercular nodules. The base of the ulcers is covered by whitish-grey exudation, and red granulations tend to show above it. Any part of the pharynx may be attacked, and, according to Fränkel, the glands of the neck are generally enlarged. The disease is certainly uncommon, and I have so far only seen a few well-marked cases. One of the patients, a man evidently in the last stage of phthisis, showed marked ulceration of his pharynx, especially of the soft palate. The sloughy ulcerated surface, due to the coalescence of separate ulcers, was covered with greyish exudation, while here and there were seen small red granulations appearing above the muco-purulent matter which bathed the parts. The pallor of the surrounding mucous membrane, the indolent ulceration, and above all the resemblance to advanced laryngeal phthisis, left no doubt as to the nature of the disease. In other cases I have seen the pillars of the fauces infiltrated, of a pale bluish-grey colour, and ulcerated, while around the ulcers were observed small yellow nodules of the size of a pin-head.

The most characteristic *symptom* is the intense pain on deglutition, associated with tubercular deposits in other parts, night sweats, evening rise of temperature, and emaciation.

The *diagnosis* can, of course, be decided by microscopic examination of the secretion for tubercle bacilli, and, by those who consider this method of diagnosis justifiable, by the injection of Koch's lymph, which, according to present ideas, would certainly produce local and general reaction.

The *prognosis* is extremely grave, and, as a rule, pharyngeal tuberculosis is a precursor of early death; although Schech mentions that permanent cure has occurred.

The *treatment* of pharyngeal tuberculosis must be both general and local. Into the former we need not here enter; the local remedies which afford most prospect of success are applications of lactic acid (20-60 p.c. solution) and menthol (20 p.c. in olive oil). The latter has the advantage of acting as an anæsthetic disinfectant and sometimes curative agent in tuberculosis of mucous membranes. Insufflations of iodoform, iodol, or boracic acid, to which one-sixth of a grain of acetate of morphia can, if desired, be added, may also be employed. A solution of cocain may be applied to the throat by means of a brush or spray, if other remedies fail to relieve pain. The food must, of course, be nutritious, bland, and unirritating. As to the merits of Koch's method of treatment, we must refer the reader to laryngeal tuberculosis; so far as I am aware, cantharidinate of potash has not been tried in pharyngeal tuberculosis.

Should a case be met with in which the pharyngeal ulceration is marked, while the general condition is fairly good, the diseased parts may with propriety be scraped, and lactic acid afterwards applied.

LUPUS.

Lupus of the pharynx may occur primarily, but in most cases it is secondary, to lupus of the face and nose. The disease manifests itself by the occurrence, on the soft palate or tonsils, of small nodules, rounded in contour, and not differing materially from congested mucous membrane in colour. These break down slowly, and are said to lead eventually to deep ulcers; although my own experience has not enabled me to observe any case of marked destructive ulceration due to lupus. Little or no pain is present. The diagnosis of lupus is arrived at—(1) by excluding syphilis; (2) the presence of the skin disease, which is not, however, constant; (3) the age and sex of the patient (lupus begins commonly about puberty, and is most common in girls); (4) the appearance of the mucous membrane; (5) the extremely slow course of the disease and the absence of distinct secreting ulcers; (6) the effects of Koch's tuberculine—but whether it is justifiable to employ this potent poison for diagnostic purposes must be considered doubtful. The lupoid infiltration is characterised by being composed of numerous small elevations, varying from a pin head to four or five times this size.

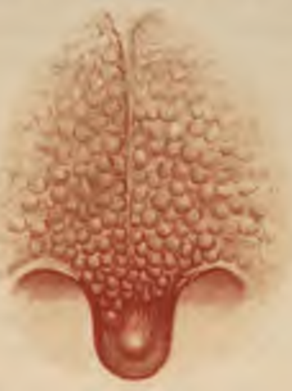

FIG. 1.—Lupus of the soft palate.

Iron, quinine, cod liver oil, and fresh air are of importance in *treatment*, while, locally, applications of lactic acid; chromic acid, and nitrate of silver are indicated. As regards operative procedure, the destruction of the diseased tissue by means of either the electric cautery or the sharp spoon, may be indicated; at the same time it must be remembered that unless the disease be very distinctly localised, not very much prospect of success attends these efforts. Koch's method of treatment may also be employed.

RHINOSCLEROMA AND LEPROSY.

Of the first of these diseases we shall have occasion to speak again in discussing the nose. It must, however, be borne in mind that the hard infiltration which characterises it not unfrequently—in so far as we can use the term of an affection so rare—involves the pharynx. It is characterised by hardness, the absence of ulceration, and a tendency to cicatricial contraction. So far as present knowledge goes, *treatment*, except operative measures to relieve stenosis, is of little avail. Doutrelepont has recorded a case in which cure resulted from inunction with an ointment containing 1 per cent. of perchloride of mercury; but it is questionable whether this method could be safely and satisfactorily applied to the pharynx.

In *leprosy*, infiltration and subsequent ulceration of the pharynx may occur, but always associated with other manifestations of the general disease.

According to Hillis in the *anæsthetic form* the palate and pharynx may become insensitive, but this does not occur until five years or more after the disease has become established. From his description it may be inferred that there is also a certain amount of motor paresis in these cases. In the *tubercular variety* he describes raised crescentic patches having a glazed appearance as occurring in the pharynx two or more years after the disease has begun. At a later period marked pallor of the mucous membrane of the mouth, larynx, and trachea, similar to that observed in phthisis, was found by the same authority. Tubercles varying in size from a pin's head to a hen's egg occur on the tongue, fauces, uvula, and roof of the mouth, and eventually ulceration and sometimes adhesions result. These later stages, as described by Hillis, are only found when the general disease is advanced, so that confusion with syphilis is unlikely to occur.

Treatment is, so far as our present knowledge goes, of little avail.

CHAPTER VI.

VARIOUS CONDITIONS.

PHARYNGOMYCOSIS.

As is well known to most practitioners the öidium albicans may show itself on the palate and pharynx, not only of children, but also of adults when weakened by disease.

A peculiar form of pharyngeal disease is, however, described by B. Fränkel and Heryng, which is produced by the undue accumulation of leptothrix on the pharyngeal structures,—under the names "Mykosis tonsillaris benigna" (Fränkel), "Pharyngomykosis leptothricia" (Heryng).

According to Schech the disease is characterised by the presence of whitish or greyish-yellow nodules or excrescences situated on the tonsils, in their lacunæ, on the pillars of the fauces, or base of the tongue. The *symptoms* seem usually to be either very slight (dryness, pricking, &c.), or altogether absent.

The *diagnosis* of the affection can, of course, be made by the aid of microscopic examination of a fragment.

This disease seems to be very obstinate, and it is therefore fortunate that its symptoms are so slight. If the tonsils only be affected they may be removed. Scraping and the galvanic cautery are recommended in other cases; but, as Schech pertinently remarks, when the patient is not much troubled by its presence, the condition may be left alone.

HÆMORRHAGES FROM THE PHARYNX.

While not prepared to deny that in the presence of a congested pharynx violent coughing or retching may lead to the rupture of a small blood vessel, yet I believe this result to be very rare. It is quite conceivable that, owing to mechanical causes, bleeding may occur from any part of the mucous membrane, including the veins on the dorsum of the tongue behind the circumvallate papillæ. At the same time, the practitioner should be on his guard not *to arrive at the conclusion that in any given case of blood-spitting the bleeding point is in the throat until he has actually seen it.* My reason for laying peculiar stress on the point is that I have seen cases assumed to be of this nature in which the real cause was to be found in pulmonary disease. To treat a cavity of the lung or commencing phthisis by painting the pharynx with an astringent solution is indeed a grave mistake. Should a bleeding point be found in the pharynx the application of cocain, followed by touching the spot with the electric cautery or chromic acid, will be found the best means of treatment.

ANÆMIA OF THE PHARYNX.

This condition is found both in general anæmia and in phthisis. It is noteworthy that while in the former the pallor is uniform, in the latter it is often associated with localised congestion, although I should hesitate to state that the last-named condition is by any means pathognomonic.

PHARYNGOCELE.

This condition is characterised by the formation of a pouch, produced by the yielding of the walls of the pharynx, usually at its lower part. Food when swallowed tends to pass into the sac thus formed by the invagination of the mucous membrane. The diverticulum may extend downwards between the œsophagus and vertebral column or outwards.

The *diagnosis* of this condition rests on the difficulty of deglutition without pain, the presence of a soft tumour on the outside of the neck, which can be dissipated by pressure, the feeling of a foreign body, the occasional ejection without preceding nausea of undigested food, and the relief which follows. The causes of the affection are not well understood; excessive use of the voice and weakness of the pharyngeal walls are the etiological factors mentioned by most authorities.

The *treatment* must be directed towards supporting the pharynx during deglutition, if the hernia be lateral, either by means of the hand or a suitable collar. If the aperture of the sac be visible by laryngoscopy an attempt may be made to produce closure of the orifice by means of the electric cautery, as suggested by Morell Mackenzie. Excision of the diverticulum by external operation has been successfully practised by Wheeler.

ANGULAR CURVATURE OF THE SPINE.

As Lennox Browne points out, disease of the cervical vertebræ may result in projection forward of the posterior pharyngeal wall, and thus lead to difficulty both in respiration and deglutition. Examination of the pharynx then shows the presence of an osseous projection from the posterior wall. A corresponding depression over the spinous processes of the cervical spine, pain, and the relief afforded by supporting the head, will aid in the diagnosis of this condition. Probably the best *treatment* is the application of a suitable support and rest, associated with such general treatment as may be called for.

FOREIGN BODIES IN THE PHARYNX.

To give a detailed list of the various foreign bodies which have been found in the pharynx would serve no good purpose. As a general rule, large and rounded substances are apt to become impacted either in the lower part of the pharynx, or, to be more accurate, at the upper part of the œsophagus, and above the epiglottis. Small sharp objects, on the other hand, are usually found entangled in the tonsils. Fish bones are the most common substances met with, and in searching for them it is necessary to use a strong light as they are sometimes embedded in such a manner as to leave only a very small piece projecting. The *symptoms* caused by foreign bodies vary. In the case of small substances caught in the tonsils or base of the tongue, only pain is complained of. When the foreign body has passed down to the level of the larynx, dyspnœa and inability to swallow may be added. It is also obvious that if a foreign substance be embedded in the tissues, secondary inflammation may result. Manifestly the danger to the patient will be determined by the size and position of the extraneous mass.

In examining for a foreign body in the throat, the physician first makes a careful inspection of the pharynx by means of the ordinary methods; he next, by taking hold of the tongue, pressing up the thyroid cartilage and using a tongue depressor, brings into view the deeper parts, according to Voltolini's plan. After this a careful laryngoscopic examination is made; and if no foreign substance or abrasion of the mucosa be thus found, palpation by means of the finger is employed.

Two sources of fallacy are liable to arise in cases of suspected foreign bodies. In the first place, hysterical and neurasthenic patients may imagine that they have swallowed some foreign body, which has lodged in the throat; and secondly, in instances where an extraneous substance has really been temporarily arrested in its course, and scratched the mucosa, the feeling of a foreign body may persist for some time afterwards; hence the importance of the presence of a scratch or ecchymosis on the mucous membrane, which tends to confirm the diagnosis in this class of case. Even when such a scratch has been discovered the surgeon is not entitled to put aside all idea of danger, for the extraneous substance may become impacted lower down, *e.g.*, in the œsophagus, trachea, or even intestines.

The *treatment* is commonly simple when the foreign body has been arrested in the pharynx proper; by means of dressing forceps it can usually be extracted with ease, a proceeding which will often be much facilitated by spraying the throat with cocain. Where, on the other hand, it has lodged in the upper part of the œsophagus or larynx, more difficulty is encountered, and tracheotomy may even become necessary. The subject, however, so far as it comes within the scope of this work, will be again considered in discussing foreign bodies in the larynx. As has been before mentioned, an impacted substance tends to set up inflammation in its neighbourhood, followed by a suppurative process which usually terminates in the elimination of the offending mass, provided a fatal result does not previously supervene; and this can usually be prevented by timely tracheotomy.

As has been already indicated, chronic inflammation of the tonsils is sometimes, though rarely, followed by the development of concretions in the glands. The crypts may become filled with cheesy, bad-smelling masses, and these finally tend to calcify and produce the so-called *calculi*, which consist mainly of carbonate and phosphate of lime.

When these concretions are present, portions of the chalky substance may be from time to time discharged, and thus a *diagnosis* can be arrived at. In other cases the presence of the calculus may be detected by palpation, or a portion of it may be seen to project from the affected tonsil, when its consistence can be ascertained with a probe. Not uncommonly suppuration results, and the offending mass is thus extruded. When the presence of a tonsillar calculus is detected it should be removed; and if the tonsil be hypertrophied, a portion of the enlarged gland may be at the same time excised. In such a case, however, the bistoury is more suitable than the guillotine.

TUMOURS OF THE PHARYNX.

(1.) *Innocent Tumours.*—The most common innocent neoplasms of the pharynx are, papillomata, springing either from the tip of the uvula or from the pillars of the fauces. Cysts, fibromata, lipomata, and angiomata have also been observed. Echinococcus cysts and cartilaginous tumours of the tonsils are also referred to by Schech, while the same author mentions myxomata and adenomata as occurring, though rarely, in the soft palate.

According to my own experience neoplasms of the pharynx—excepting papillomata—are of extreme rarity. I once saw growing from the left tonsil of a boy a tumour of pyriform shape and pedunculated, which gave the impression of being composed of the same tissue as the gland. To the best of my recollection this condition was discovered on examining the throat on account of middle ear catarrh, and the growth caused no symptoms. I proposed to remove it at the patient's next visit to the dispensary, but he failed to appear. In all probability this was a case of accessory tonsil, other examples of which have been recorded by Morgan, Schech, and Baudler.

I have also met with a case in which a large exostosis grew from the anterior portion of the cervical spine. This might at first have been mistaken for angular curvature, but the absence of pain and tenderness together with the history negatived this view. The tumour caused no inconvenience, and was found accidentally in examining the pharynx of a gentleman who suffered from middle ear catarrh. There was in this case also a similar growth on the skull.

Tumours of the pharynx produce *symptoms* in proportion to their size and the nervous irritability of the person in whom they occur, and can of course be easily *diagnosed* by inspection.

The *treatment* of pedunculated tumours is very simple. Papillomata can be removed either with scissors or the electric cautery snare, while in the case of large neoplasms the latter is always to be preferred. The removal of non-pedunculated growths must be conducted on general principles.

(2.) *Malignant Tumours of the Pharynx.*—According to my experience malignant growths are more common in the pharynx than innocent tumours, excepting papillomata.

I have seen numerous examples of *cancer* of one tonsil. In these more or less difficulty of swallowing was complained of, and pain was usually a prominent feature of the disease. In one of them, a middle-aged man, the first symptom was great pain in the side of the throat, shooting up to the ear. This patient attended my clinic for a considerable time, during which his throat—carefully examined as it was by the laryngoscope and rhinoscope—showed only evidence of chronic pharyngitis, with slight enlargement of the right tonsil. The case was for some time looked upon as one of neuralgia, until glandular enlargement at the angle of the jaw and manifest increase in the size of the tonsil led to digital exploration, which gave the *characteristic fixed indurated feeling* of malignant disease. In order to confirm my diagnosis I sent the patient to my colleague, Mr. Duncan, who also independently pronounced the case to be undoubtedly malignant. As an operation was considered hopeless the patient was ordered to take 3 grains of Chian turpentine several times a day, under which—as Mr. Duncan, who last saw the case, informed me—considerable improvement resulted. Unfortunately the patient disappeared from treatment at the Royal Infirmary, so that his subsequent history is unknown to us. When ulceration has occurred in a cancerous tonsil the case may be mistaken for one of syphilis; but the enlarged glands in the neck, or at the angle of the jaws, and the fixed feeling of the affected tonsil when examined by palpation, together with the fact that the ulcer does not improve—although the pain may become less—under iodide of potassium, form a clinical combination which it is not easy to mistake. In doubtful cases a fragment may be removed for microscopic examination, and the nature of the case thus determined.

I have met with one case of *lymphosarcoma* of the tonsil, but in its clinical characters and course it did not differ materially from true cancer.

It is noteworthy that epithelioma of the tonsils seems rarely if ever, to occur, most of the recorded cases so far having been alveolar cancer.

I have met with *epithelioma* of the palate, however, and also of the posterior pillar of the fauces. A woman of 63 consulted me in March 1889, giving the following history:—About a year ago she complained of pains in the ear and throat, which afterwards seem to have ceased entirely for a time. In August, however, the symptoms reappeared. In November a relative (non-medical) looked at the throat, but, judging from his description, there was then nothing to be seen except some evidence of hypersecretion. Since this time she had occasionally expectorated blood. On examining the pharynx, a warty, ulcerating mass was seen behind the right posterior pillar of the fauces. Rhinoscopic examination showed that the warty growth extended both on to the back of the soft palate and vault of the pharynx, beyond the middle line. The neoplasm felt very hard on palpation, and the glands in front of the sterno-mastoid on the right side were enlarged. There was no doubt as to the malignant nature of the tumour, and it was equally certain that no hope of removal could be entertained. Under these circumstances palliative remedies and Chian turpentine were recommended.

The *prognosis* is very grave, as, in most cases, no operation can be attempted with a hope of success.

Treatment must, therefore, aim at maintaining the strength of the patient, relieving pain by the local application of anæsthetics or the internal administration of narcotics. In cases of cancer, in which operation is impossible, I always advise the use of Chian turpentine, beginning with three grains thrice a day, and gradually increasing the dose if the remedy be well tolerated by the digestive organs. This drug is usually ordered in pills, made up with sulphur; but a solution in ether, with mucilage, syrup, and sublimated sulphur, is more suitable for throat cases. It is also usual to prescribe arsenic, iron, and other tonics.

NEUROSES.

Anæsthesia of the pharynx may occur as a sequel of diphtheria, and indeed this is probably the most common form of neurosis. Obviously, any central lesion which involves the glosso-pharyngeal nerve must also affect the sensibility of the pharyngeal mucosa. I have met with unilateral anæsthesia of the pharynx and larynx associated with paralysis of the palate and larynx, due to a cancerous tumour attached to the base of the skull. According to Krishaber, anæsthesia of the pharynx may be an early symptom of bulbar paralysis; while in hysteria diminished sensibility is often present.

The *treatment* of this condition varies according to its etiology. In post diphtheritic cases the use of the interrupted current, and the internal or subcutaneous exhibition of strychnine, are indicated; while the same may be said of such other cases as depend upon causes in which treatment can be reasonably expected to yield a result. If the anæsthesia be bilateral, deglutition may be difficult, and artificial feeding may become necessary, especially if the larynx be also anæsthetic, in order to prevent food from entering the air passages.

Hyperæsthesia of the pharynx can hardly be called an abnormality. So far as I have been able to observe, it is frequently associated with either a gouty diathesis or a tendency to alcoholic excess on the part of the patient.

Neuralgia of the pharynx is not a common affection. It may occur in anæmic women, but I have seen it in men associated with more or less hypertrophic pharyngitis.

Closely allied to neuralgia is *paræsthesia* in which the patient—often an hysterical female—complains of the feeling of a "lump" or foreign body in the throat, a symptom usually spoken of as globus hystericus. Such persons not uncommonly come to the physician with a definite statement as to the presence of an extraneous substance, such as a pin. A little questioning, however, usually elicits a history which at once disposes of the patient's theory. In all cases of this kind, however, we need hardly say that a most thorough and careful exploration both of the pharynx and the larynx should be made. In some of these, laryngoscopic examination shows the presence of hypertrophy of the adenoid tissue,[1] situated behind the circumvallate papillæ on the dorsum of the tongue. This lingual tonsil may be so increased in size that it is in more or less constant contact with the tip of the epiglottis, and thus leads to the subjective sensation of a foreign body. To assume, however, that this is the usual cause of globus hystericus is a mistake, for paræsthesia is commonly of a purely nervous character, as its name indicates. In the various forms of pharyngitis abnormal sensations are often present in the throat, and, as we have seen, those so often experienced by the victims of the hypertrophic variety are probably in great part of a purely functional character, *i.e.*, more or less dependent on the condition of the nervous system and general health.

In the *treatment* of neuralgia and paræsthesia, it is of the first importance to attend to the patient's general health. In the acute forms of neuralgia such remedies as quinine and antipyrin may be tried, while local applications of cocain may be employed from time to time; care must, however, be taken not to place this drug unreservedly at the patient's disposal. Morell Mackenzie recommends the local application of tincture of aconite, while menthol applied by means of a brush (20 p.c. in olive oil), or as pastilles (¼ gr. in each), may prove useful. In neurotic individuals bromide of potassium and valerianate of zinc (gr. i. thrice daily) are often indicated. Any ovarian or uterine irregularity must be attended to, and the same may be said of faulty digestion. General anæmia, which so often exists in these cases, must be treated by arsenic and iron. Massage of the pharynx and cold douching may prove of service in some cases, while in others the constant current may be tried. Where marked evidence of hypertrophic pharyngitis, or enlargement of the adenoid tissue at the base of the tongue is detected, and the case resists general treatment, the electric cautery may be applied. In such instances it is better to localise the pain as far as possible, and to apply the heated platinum point to such of the hypertrophic tissue as is nearest the painful spot. It goes without saying that the other remedies which have been mentioned in connection with chronic pharyngitis should be tried before this more severe treatment is applied.

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[1] See the section on *Diseases of the Larynx*.

There can be no doubt that many cases of paræsthesia of the pharynx are due to general neurasthenia, and that the last-named condition requires treatment when it exists. If anæmia co-exists, as it often does, iron, arsenic, and fresh air are of great importance. We now know also that such patients should avoid waste of nervous energy,—an object which may be attained by prolonging the hours of sleep and taking exercise, always short of causing actual fatigue. Liberal diet should be associated with this line of treatment, and we thus produce a modified form of the regimen which has proved so useful in the hands of Weir Mitchell.

As a *neurosis of secretion* Schech describes certain cases in which the patient complains of a constant desire to expectorate. If, together with this symptom, we find a healthy mucosa and the absence of unhealthy secretion in the pharynx, larynx, and nares (anterior and posterior), we must look upon the condition as due to abnormal activity of the glands—mucous and salivary. In such cases as I have observed, it seemed to me that the expectorated matter—which is usually frothy and mingled with a little viscid mucus—is in great part produced by the act of clearing the throat. The patient should be assured that there is no disease, and directed to refrain from "hawking and spitting."

Schech also describes—as a *vasomotor neurosis*—a form of catarrhal sore throat, which occurs associated with each menstrual period.

Clonic spasm of the palate muscles occasionally occurs. It is troublesome to the patient, chiefly on account of the disagreeable sound which accompanies each contraction. The treatment of such cases is to be conducted on general principles; iron, arsenic, bromides, and valerianate of zinc may be indicated on general grounds. Gruber states that in some cases much can be done by making the patient control, by an effort of volition, the contractions of the palate muscles.

Paralysis of the soft palate is of very considerable interest to the physician. It may be due to cerebral diseases of various kinds, involving the spinal accessory nerve, and is one of the conspicuous symptoms of bulbar paralysis, although diphtheria is its most common cause. The affection is usually unilateral, but not unfrequently both sides are involved. On inspection of the palate paresis is readily recognised. If one side only be affected, the corresponding half of the velum lies lower and appears wider than the other, while not uncommonly the uvula is drawn to the opposite side, and on phonation the paralysed part shows diminished mobility. When both sides are involved deglutition is difficult, food and drink tending to be thrown up into the naso-pharynx, and even passing out of the nostrils. The voice has a peculiar nasal timbre, and on phonation the palate moves slightly or not at all, according to the degree of paresis. Whether facial paralysis ever produces marked paresis of the palate must, I think, be considered extremely doubtful. While most British anatomists and physiologists seem still to teach that the levator palati is innervated solely by the seventh nerve, this dictum was rendered doubtful through facts noticed by Continental observers more than ten years ago, for Hein's experiments and clinical facts, recorded by Erb, Seeligmuller, and Holz, pointed to the influence exerted by the spinal accessory nerve on the movements of the palate. Quite recently Beevor and Horsley have definitely proved that in the monkey the seventh nerve has no share in the motor supply to the palate, and that the levator palati is supplied altogether by the spinal accessory nerve. It follows, therefore, that paralysis of the palate may be produced by any lesion which involves this nerve, either at its centre or after its exit from the skull. The *treatment* of paralysis of the palate must depend upon the cause. In diphtheritic cases, galvanism and strychnine, with tonics, usually expedite the cure.

THE LARYNX.

DISEASES OF THE LARYNX.

CHAPTER I.

EXAMINATION AND SEMEIOLOGY.

It is usual, in works on laryngology, to begin the subject by an elaborate *resumé* of unsuccessful efforts to see the vocal apparatus in the living subject. Although of historic interest, such recapitulation can hardly be considered practical. It suffices here to state that Signor Garcia, a singing-master in London, was the first to examine the larynx in the living subject, and some years later Türck of Vienna, and Czermak of Pesth, introduced the laryngoscopic method to the notice of the medical profession.

Examination.

In order to examine a larynx, the physician must have at his disposal—(1) a laryngeal mirror; (2) a light of sufficient intensity to enable him to see the reflected image.

The Laryngeal Mirror.—It is superfluous to describe in detail an instrument which is known—at least by sight—to every advanced medical student. A small mirror of circular form[1] is attached to a stem at an angle of about 120 degrees. These mirrors are of different diameters, and in the cases made by Reiner of Vienna are of five sizes, the largest being marked 5, and the smallest 1. The last named is, however, seldom used for laryngoscopy, although commonly employed in rhinoscopy. In adults it is best to employ the largest, as of course the parts are better seen the greater the reflecting surface; often, however, No. 4 is more suitable to the capacity of the pharynx. The smaller mirrors are of service when the tonsils are very large, and in children.

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[1] Other shapes are less convenient, and rarely, if ever, used.

In each case are two handles, to one of which may be fitted a mirror of the required capacity, while a laryngeal probe can, if required, be attached to the other. Each case also contains a láryngeal reflector, so that we are thus supplied, at a small cost, with all the apparatus required for laryngoscopy.

Illumination.—In a practical manual it is desirable to consider, not every possible or every suggested method of illumining the larynx, but only those which are of practical utility. Examination of the larynx may be practised by letting a powerful light fall directly upon the laryngeal mirror; for this purpose sunlight, and concentration of light by a glass or water lens, have been employed, but this method is now rarely practised. The mode of examination, which surpasses all others, is that by means of light reflected from a mirror perforated in the centre, so placed that the aperture is opposite to the eye of the observer. The mirror should have a focal distance of about fourteen inches, and be adjusted comfortably to the head of the physician by a forehead band, spectacle frame, or one of the numerous other devices suggested for this purpose. The apparatus I usually employ is that recommended by Schrötter,[1] which consists of a forehead band, attached to which are two soft cushion-like pads for resting on the nose, and below them a socket receives a circular ball, to which is attached the reflecting mirror. The last named is perforated in the centre, and can be moved in any direction by means of the ball and socket joint.

Having discussed the reflector, let us now consider the various sources from which light may be procured.

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[1] This mirror is contained in Reiner's cases.

No doubt a tolerable view of the larynx can be obtained by a practised laryngoscopist by means of reflected daylight from a window, but a minute examination is impossible. A good gas burner, or a common lamp, however, enable us to obtain a very fair image of the larynx in cases where more powerful illumination is not available. For more exact diagnosis, and in a consulting room, it is better to employ a light specially adapted for the purpose. A powerful oil lamp, or a good argand burner, will probably be found most convenient by the general practitioner. As it is desirable that the light should be a little above the patient's mouth and close to one side of his head, it is well to have the lamp so adjusted that it can be raised and lowered at will. Morell Mackenzie's rack movement bracket will be found most useful for this purpose, and although the apparatus is expensive, it is not readily put out of order. If the light is to be used only for laryngoscopic and rhinoscopic purposes, and if gas be obtainable, it is well to have one of these brackets, with the flame enclosed in a concentrator, *i.e.*, a funnel with an opening filled by a biconvex lens opposite the flame. As I have before stated, a good argand burner is sufficient for most purposes; but if the physician be in the neighbourhood of a town where the incandescent hood can be quickly replaced, I should recommend the Welsbach light, adapted to Mackenzie's rack movement bracket and concentrator. The advantage of this light is its white colour, and the very slight amount of heat generated. Its disadvantage is that the incandescent hood may readily break, and require to be replaced. Such an accident, however, is rare, if only a *spirit flame* be employed to light the burner. To avoid misunderstanding, I may here again mention that an ordinary good argand burner, or oil lamp—without any special concentrating apparatus—is sufficient for a satisfactory examination of the larynx.

If a more powerful light be desired that derived from the unclouded sun is the best. As the ordinary reflector is concave, it is often stated that a plane mirror must be procured for examination with reflected sunlight. So far as my experience goes, we do not require this if only care be taken to avoid focussing the light upon any part of the mucous membrane, lest a burn be thus inflicted. Unfortunately, in our climate the sun cannot often be utilised. Probably the most perfect substitute for its rays is the oxyhydrogen light—coal gas being substituted for the hydrogen. This, however, involves not only an expensive apparatus, but also a supply of oxygen, while the whole occupies a considerable space; for this reason the oxyhydrogen light is rarely met with excepting in the consulting room of the specialist. Electricity is employed for illumining the larynx in various ways. Sometimes a minute light is adjusted so that it lies just in front of the laryngeal mirror in the throat of the patient. Such a small lamp may be lighted by means of a pocket accumulator, and, of course, no reflector is required.[1] An electric light (photophore) may, however, be so arranged as to be adapted to a forehead band, or so that it can be reflected into the mouth with a mirror. In either case, a most satisfactory substitute for sunlight is thus afforded. A very powerful light can also be procured by burning magnesium wire which is given out by a regulated clock work. The objection to the continued employment of this mode of illumination is, however, the fact that the room is soon filled with a vapour of calcined magnesium, and special provision has to be made in order to carry off the particles by means of a chimney.

It is often desirable to have a portable light, and to meet this requirement I have had made a stand to which can be affixed at will an argand burner or an oil lamp; when gas is used the stand is connected with the jet by means of an indiarubber tube. In either case, the light is surrounded by Mackenzie's concentrator.

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[1] I may remark that my experience of accumulators has been so unsatisfactory that for all manipulations requiring electricity I shall, in the immediate future, always trust to a primary battery.

Let us now turn our attention to the actual method of employing the apparatus we have discussed.

The patient is seated on a chair with the head thrown slightly back, and to one or other side of him is placed the light. The lamp should be so arranged that it is a little above the level of the mouth. The observer now seats himself in front of the patient, adjusts the reflector so that its central opening is opposite one eye—usually the right. As an examination of the pharynx usually precedes laryngoscopy, an idea has probably thus been gained as to the size of mirror likely to be required. The laryngeal mirror is now heated by holding its reflecting surface above the flame until a film of moisture has formed over it and again disappeared. At this stage the surface is sufficiently warm to prevent condensation of the patient's breath; but before introduction it is well to apply it to the hand in order to ascertain that the heat is not so great as to cause pain. The patient is now requested to protrude the tongue as far as possible, and in this position the organ is retained by holding it between the index finger and thumb. To prevent slipping, either the patient's handkerchief, or a tongue-cloth, is used for holding this sometimes unruly member. In both private and hospital practice it is well to have a number of these little cloths, and, of course, a clean one is used for each individual. Light is now concentrated on the pharynx, while the patient is told to breathe quietly but deeply. On inspiration the uvula is seen to rise, and at this moment the mirror is passed into the mouth, pressed gently but firmly against it, so that the reflecting surface is directed downwards and forwards. The immediate effect of this manœuvre is to bring the epiglottis into sight, and if this part be not unduly dependent, also the interior of the larynx. A common fault of beginners is to hold the mirror at such an angle as to reflect light only upon the epiglottis and contiguous dorsum linguæ. If the mirror be really pressed against the uvula, this want of success is usually due to the fact that the angle which it forms with the line of the palate is too small;

in other words, the light is reflected too much forwards, and not sufficiently downwards. To rectify the mistake, the position of the reflecting surface is changed, so that a view of the interior of the larynx is obtained. The image is, however, often still incomplete, because the epiglottis tends to cover the anterior part of the vocal organ. This obstacle is usually got rid of by asking the patient to say "eh," the result of which is to make the epiglottis rise and approximate the vocal cords. Should this fail, the patient may be directed to take short, rapid inspirations, or the neck may be extended as far back as possible,—a proceeding which sometimes enables the physician to reflect light into a larynx in which the epiglottis is difficult to raise; occasionally the same object may be attained if laughing be attempted while the mirror is *in situ*. Further difficulties which may be encountered we shall consider later. It is now necessary to consider the *laryngeal image*. Owing to the position of the mirror in the pharynx, everything which is really in front is seen above, and the posterior parts below; but there is, of course, no further inversion. The vocal cords usually first catch the eye as they are conspicuous by their dazzling whiteness (*a*). They appear as two white bands, which are usually stated to move slightly outwards on quiet inspiration, and inwards on expiration, but, according to Semon, they are more frequently stationary.

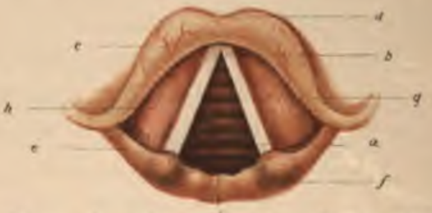

FIG. 2.—Larynx in quiet respiration, showing (*a*) vocal cord; (*b*) anterior commissure; (*c*) region of cushion of epiglottis; (*d*) epiglottis; (*e*) ary-epiglottic fold; (*f*) arytenoid cartilage; (*g*) ventricle of Morgagni; (*h*) false cord on ventricular band; (*i*) inter-arytenoid fold.

During phonation they appear to be in contact throughout their whole length. On inspecting the cords closely, a yellow spot will often be seen near the posterior extremity of each; this indicates the junction between the ligamentous portion of the glottis in front and the vocal process behind. The cords are seen to meet anteriorly in all positions of the larynx at the *anterior commissure* (*b*); and just above their junction is a slightly raised pink surface, called the *cushion of the epiglottis* (*c*). Above this again is seen the *epiglottis* (*d*). Sometimes only its lower surface is visible; but commonly a part of both upper and lower can be seen. This valve varies much in shape. Usually it is broad and folded backwards, although it is not uncommon to see it elongated and bent upon itself, so that a lateral convexity presents upwards. When the valve has this shape the anterior commissure and cushion can rarely be satisfactorily examined. The upper surface of the epiglottis should now be inspected, and it will be seen to be attached to the base of the tongue by means of a prominent *central glosso-epiglottic* ligament and two *lateral glosso-epiglottic ligaments*. The spaces formed by these bands are spoken of as *valleculæ*. At the same time the contiguous part of the dorsum linguæ will be seen, and it is desirable to observe its condition. Passing from the margins of the epiglottis on each side are the two well-defined *ary-epiglottic folds* (*e*), which really form the boundaries of the larynx proper. They are red in colour and each marked posteriorly by two elevations—an external smaller one, the *cartilage of Wrisberg*, and an internal, the *capitulum of Santorini*. The capitula of Santorini are situated on the apices of the arytenoid cartilages, and correspond in position to the posterior extremities of the vocal cords. The *arytenoid cartilages* (*f*) are now also seen, with the vocal processes attached to their bases. During respiration, a fold of mucous membrane is seen to exist between them, the *inter-arytenoid fold* (*i*). Returning once again to the vocal cords from which we started, we find that each is bounded externally by a dark line, which closer inspection enables us to perceive is a cavity, the *ventricle of Morgagni* (*g*). Outside of this again is a fold of mucous membrane running parallel to the vocal cord, the *ventricular band*, or *false cord* (*h*), situated between the vocal cord and the ary-epiglottic fold. External to the ary-epiglottic fold on each side, and therefore external to the larynx proper, is the *sinus pyriformis* or *hyoid fossa*. This cavity can be best examined on phonation, and can be most satisfactorily studied, as pointed out by Vohsen, when the head is slightly turned to the opposite side.

On inspecting the larynx we must look in the first place at the colour of the parts. The tip and upper surface of the epiglottis are often yellowish in colour, while the vocal cords are normally white. It is important, however, to remember that Semon considers a slight pink tinge as within the normal limits for men whose profession obliges them to use their voices. The remaining parts of the larynx may, for all practical purposes, be looked upon as similar in colour to the mucous membrane of the mouth. In studying the colour any gross changes should, of course, attract attention. A laryngoscopic examination cannot, however, be said to be completed until the larynx has been examined in different positions. During quiet respiration the cords are separated from each other by a triangular space, which varies either slightly or not at all during inspiration and expiration. On deep inspiration, however, the cords gape considerably, and in a favourable case a number of tracheal rings come into view, while not unfrequently the bifurcation can be seen. A deep view of the windpipe is facilitated by placing the reflecting surface of the mirror more horizontally, and by having the patient's head on a rather higher level than that of the physician. In this way, too, a better inspection of the posterior laryngeal wall can be made, especially if, as Killian suggests, the chin be depressed and the head inclined forward. By some authorities it is recommended, in order to study the posterior wall, that a second small mirror, capable of being adjusted at any desired angle, should be introduced between the cords, but of this method I have no personal experience. It is important to notice whether during forced inspiration the cords separate to the normal extent, and whether one or both move less freely than in health. It must, however, be remembered that many persons, owing to nervousness, tend to approximate the cords during inspiration, and thus an image is produced which might lead the unwary observer to diagnose paresis of abduction. However, repeated examination, the absence of stridor, and inspection after placing the patient at his ease will usually prevent such a mistake. The shape of the glottis on phonation, and the movements of the cords during this process, must also be noticed. In exceptional cases the arytenoid cartilages, with the capitula of Santorini, are seen to cross each other, but this is not necessarily an indication of a pathological condition.

I have thus far discussed the ordinary method of laryngoscopy and the information to be derived from its practice. There is, however, a form of laryngeal examination which, although practised by Czermak, has remained unknown, or, if not unknown, unnoticed by the profession at large. I refer to the illumination of the larynx by means of a strong light thrown upon the crico-thyroid membrane and adjacent part of the neck. That this method has not lapsed into entire obscurity is due to Voltolini, who recognised its value, and both practised it and advocated its employment for years. I suspect that the reason which actuated the authors who did not mention it in their text-books, and the laryngologists, who considered it of no practical value, was simply the fact that they had either not tried it or had used an insufficient light. The method consists in throwing a powerful light on the neck and then introducing a mirror in the ordinary manner into the mouth, which, of course, is a dark cavity. We thus see in persons whose throats are tolerably thin the vocal cords as red bands and the subglottic space. So far as I have used this method, reflected sunlight and the oxyhydrogen lamp have given the best results, although I have been able to employ it with a Welsbach burner. Voltolini has, however, used electric lamps placed over the throat, supplied with water lenses to avoid excessive heat. In this way even persons with a good deal of adipose tissue may be examined. I cannot but believe that this "through illumination"[1] will be found useful for examining the subglottic structures, estimating the thickness of membranes, and perhaps also for diagnosing between a growth which is merely attached to the vocal cord and a tumour with an infiltrating base.

We must now consider briefly some conditions which form impediments to laryngoscopic examination.

(1.) *Want of care in introducing the Laryngeal Mirror.*—The beginner is not unlikely at his first attempts to produce unnecessary irritation of the throat. The handle of the mirror is most conveniently held as a pen in writing: at first it is introduced so that the reflecting surface is directed towards the tongue. This position is necessary in order to avoid touching either the palate or lingual surface. Whenever the base of the uvula is reached the hand is raised and the reflecting surface adjusted as previously described.

(2.) *Holding the Breath on the part of the Patient.*—This difficulty is readily overcome by giving directions to breathe regularly by the mouth, and explaining that the mirror by no means interferes with respiration.

(3.) *Difficulties produced by the Tongue.*—A frænum so short as to prevent the patient from protruding the tongue is by no means uncommon. In such cases the organ must be depressed by a spatula while the examination is made. It is worthy of note that this abnormality cannot be diagnosed by the presence of any impediment in speech, and yet the individuals suffer from that classical affection—tongue-tie. Sometimes, although the organ can be protruded, the dorsum linguæ tends to arch in such a manner that the introduction of a mirror is impossible. If this state of matters cannot be got over by directing the patient's will towards forcible protrusion of the tongue, the depressor will have to be employed.

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[1] As this method has been almost entirely discussed in German, I retain a translation of the Teutonic word "Durchleuchtung," although "examination by transmitted light" would be more elegant.

(4.) *Hyperæsthesia of the Pharynx.*—According to my experience this is most commonly met with in the gouty and among those who use alcohol or tobacco to excess. The application of a 10 p.c. solution of cocain will usually at once overcome this obstacle. The drug may be applied either by means of a brush or a small spray producer.

(5.) *Hypertrophied Tonsils.*—These rarely form an obstacle to examination unless of such a size that their removal is indicated.

(6.) *Overhanging Epiglottis.*—If the epiglottis cannot be raised by making the patient sound a high note or take short, quick inspirations, considerable difficulty will often be experienced in obtaining a view of the larynx. Sometimes by directing the individual to laugh the desired end is attained, but when this also fails it will be found necessary to raise the epiglottis. The most satisfactory proceeding in such cases is to spray the throat during inspiration with a 10 p.c. solution of cocain. After about a minute the mirror is introduced with the left hand, and with the right a laryngeal probe is hooked under the epiglottis and the part raised.

Before concluding this portion of our subject, it may be well to say a word as to *auto-laryngoscopy.* If the laryngologist desires to see or practise upon his own throat, the simplest method is that suggested by Dr. George Johnson. An ordinary toilet mirror is placed alongside of the lamp, and light is then thrown by the observer upon his own reflection, which he treats in all respects according to the directions previously given.

In some cases it is desirable to inspect the trachea. This, in a suitable case, can usually be done by placing the patient rather higher than for laryngoscopy, and, by holding the laryngeal mirror more horizontally, a good view of the anterior wall and bifurcation may be thus obtained. In order to see the posterior wall of the larynx and trachea, Killian advises that the patient's head be strongly inclined forward, while the physician, working at a lower level (*e.g.*, kneeling if the patient be seated), introduces a large mirror, which is not put so far back as usual, and pressed strongly against the uvula.

It is occasionally advisable to add to our information by other methods of examination. Thus, *external inspection* and *palpation* may reveal the presence of swelling, tenderness, crepitus, or displacement; while the *introduction of the finger* into the interior of the larynx may be necessary if the presence of a foreign body be suspected and no laryngoscopic examination is possible.

Of more importance is the *laryngeal probe*—an instrument adapted in length and curve for the purpose it is intended to fulfil. The probe is introduced with the right hand while the mirror is held with the left, and the patient himself controls the tongue. It is chiefly useful for determining the attachment and mobility of tumours, and for accustoming the patient to the presence of an instrument in the larynx when a subsequent operation is contemplated. Laryngeal probes made of aluminium are very serviceable, as owing to their extreme lightness great delicacy of touch is rendered possible.

GENERAL SEMEIOLOGY OF LARYNGEAL DISEASE.

One of the most common symptoms in laryngeal disease is, of course, *interference with phonation.* The voice may be husky or absent; in rare cases a double note is stated to be produced in the larynx (diplophonia), and sometimes the patient, although an adult, speaks with a falsetto voice. Diplophonia I have never observed, but it is stated by

Gottstein to occur in some cases of paralysis, and also sometimes when a small tumour is situated so that on phonation it lies between the cords. It is of the greatest importance to remember that marked changes (paresis and tumours) may exist without producing any appreciable change in the voice.

Dyspnœa may, of course, be due to laryngeal disease and is commonly inspiratory, unless caused by a mobile subglottic growth. It is an interesting fact that stenosis of an acute character produces marked difficulty in breathing much more readily than a much greater amount of constriction which has developed slowly. In out-patient practice the physician is often astounded by the small lumen of the glottic aperture, which enables its possessor to go through the exertion necessary to visit the clinic.

Pain is not a common symptom in many laryngeal diseases. A feeling of rawness is complained of in acute catarrh, while in certain affections (notably cancer and phthisis) marked pain, often shooting up to the ears, is present. Neuralgia may also be met with, and anomalous uncomfortable sensations are frequently experienced by the neurasthenic.

Cough is by no means a very common symptom, unless the posterior wall of the larynx and interarytenoid fold be diseased. Clearing the throat, in order to get rid of the sensation of a foreign body due to mucus or swelling, is, however, a frequent phenomenon. Laryngeal cough is often characterised by a peculiar barking note (often spoken of as "croupy").

Expectoration, having its source in the larynx only, is usually quite scanty, and when any large quantity is present, the parts below are usually found at fault. *Hæmoptysis* has very rarely its origin in the larynx; in only one case was I enabled to see a bleeding point by means of the laryngoscope. The practitioner should bear in mind that if any quantity of blood be expectorated by a patient, who has no gross change in the pharynx or larynx to account for it, the hæmorrhage is almost certain not to have originated in either of these parts.

In examining patients, it is, of course, necessary to obtain a history of the complaint from which they suffer, and in many cases the general health must be investigated. There is, however, one question which should almost invariably be asked, viz., What is the sufferer's profession? In the case of persons who use the voice in the exercise of their vocation, an affection which would be trivial in others, may become a serious matter. Again, those who suffer from laryngeal catarrh, and whose occupation keeps them in impure atmosphere, often impregnated with dust-particles, are unlikely to recover rapidly unless they be removed from such noxious influences.

CHAPTER II.

GENERAL THERAPEUTICS.

In discussing laryngeal therapeutics, it is unnecessary to enter upon such subjects as external counter irritation, the application of heat, cold, and leeching. The common sense of every practitioner will indicate to him the methods of making such applications; and as to general indications, we have already referred to the local effects of heat and cold in considering the therapeutics of the pharynx.

Let us turn now to remedies applied to the interior of the larynx.

INHALATIONS.

In laryngeal, as in pharyngeal, disease, steam inhalations are very frequently employed. It is usual to add to the water used for this purpose, at a temperature of about 130°, such remedies as are of a sufficiently volatile nature to be of service. Those most commonly utilised are tinct. benzoin. co., oil of pine, and creasote. It is, as before stated (pharyngeal therapeutics), difficult to ascertain whether the steam, by moistening the tissues, is not more important as a therapeutic agent than the small amount of volatile substance it contains. Chloride of ammonium inhalations are often useful in catarrhal conditions of the larynx.

If we desire to use a volatile substance, it is probably best to employ it by means of a respirator, such as Yeo's, when it can be inhaled continuously for a long period. I frequently order a solution of menthol to be used in this way; and other substances, such as pine oil, oil of pumiline (a more elegant preparation, similar in its effect to the preceding), or other volatile remedies may be used in the same way.

LOZENGES AND VOICE STIMULANTS.

Lozenges are sometimes recommended in laryngeal disease. Morell Mackenzie advocates the benzoic acid lozenge of the London Throat Hospital Pharmacopœia as a voice lozenge, while I have found pastilles containing ¼ gr. of menthol useful for the same purpose, *i.e.*, stimulating a weak voice which must be used. A glass of the Vin Mariani de Coca, or a cocain spray, may also be serviceable under these circumstances. If it be desired to produce an astringent effect, the Krameria lozenge of the London Throat Hospital Pharmacopœia may be ordered.

SPRAY INHALATIONS.

It is customary among laryngologists to decry this method of medication, and to deny its efficacy in such affections as chronic laryngitis. While quite willing to admit that it is inferior in value to applications made directly to the diseased part by means of a brush, it has the inestimable advantage of permitting the patient to dispense with frequent visits to the hospital or consulting room. That fluid sprayed into the back of the pharynx during inspiration really reaches the larynx is proved by the anæsthetic effect of a cocain solution used in this way. If the steam spray—known as Siegle's—be employed, we have the added advantage of warmth in cases where it is indicated; but in employing astringents the dilution of the remedy by the water vapour is an objection. It is then better to use a cold spray, by means of one of the many spray producers now in the market. That suggested by Prosser James is a convenient and cheap apparatus; while for applying cocain the miniature spray (Symes & Co.) is extremely useful. If it be desired to employ an oily vehicle then the De Vilbiss apparatus must be used, otherwise it does not seem to me to be of much importance what instrument be selected, but the nozzle should be inserted into the mouth and the patient directed to inhale as much of the remedy as he can. The spray is used for a few minutes, with, of course, frequent intermissions, several times a day. If Siegle's apparatus be recommended it is well to prohibit going into cold air for at least an hour afterwards, and I may add that this applies with equal force in the case of simple steam inhalations. The remedies employed in this way are numerous. Of astringents we may mention, as examples, tannic acid (gr. v.-x., ad ℥ i.), alum (gr. viii., ad ℥ i.), perchloride of iron (gr. v., ad ℥ i.), etc. etc. In cases where excessive dryness is present carbolic acid solution (gr. iii., ad ℥ i.) is recommended by Morell Mackenzie.

DIRECT APPLICATIONS TO THE LARYNX.

For this purpose the *laryngeal syringe* is occasionally employed. The form usually recommended consists of a bent vulcanite tube, having connected with its lumen a small receptacle, over which is spread a diaphragm. Pressure on the last named causes the contained fluid to be ejected from the tube. Another variety is that suggested by Rosenberg for the application of menthol. This consists simply of a glass syringe, attached to which is a vulcanite nozzle with a curve suitable for introduction into the larynx. By means of this instrument a solution of menthol in olive oil (20 p.c.) is frequently injected in cases of laryngeal and pulmonary phthisis. More recently it has been suggested to employ injections of lactic acid in the same disease.

Brushing the larynx is the method of applying remedies which finds most favour, and it is the first special manipulation the beginner is likely to be called upon to perform. In selecting a brush the following points are of consequence, viz., (1) the size and shape of the handle; (2) the shape of the brush; (3) the attachment of the brush.

As regards the shape of the handle, brushes vary, according as they are purchased in Britain or on the Continent. In this country, instruments intended for introduction into the larynx are usually made with a somewhat sharp curve, so that the laryngeal extremity is almost at right angles to the shaft. This pattern, which was suggested by Morell Mackenzie, is certainly preferable to the long curve employed by our Continental *confréres.* It is further of importance to have the brush itself delicately made, and so constructed that when saturated with fluid it tapers to a point. It is usual to have handles, the laryngeal extremities of which are of different lengths, so that variations which occur in the distance between the uvula and larynx in different persons may be allowed for. These handles are so arranged that a brush can be screwed on to their extremities, and as one has been used it may be either thrown away or disinfected. It is of the utmost importance to be careful that the connection between brush and handle is satisfactory before the instrument is introduced into the larynx, and also to see that there are no loose hairs. In introducing the brush the mirror is held in the left hand (the patient himself attending to the tongue), and the instrument is passed in so that it does not touch the epiglottis, but slips down behind it; by elevating the hand it is then made to come in contact with the larynx proper. Instead of a brush, sponge or cotton wool may be employed. In the former case, the sponge may be so arranged that it can be screwed to the handle, and in the latter a special catch forceps of suitable shape must be employed. As examples of remedies used by means of the brush, we may mention nitrate of silver (gr. 10-30, or more, ad. ℥i.), chloride of zinc (gr. 15-30 ad. ℥i.), and iodine (gr. vi. ad. ℥i.), as mentioned in discussing pharyngitis.

Another form of laryngeal medication is the *insufflation of powders.* For this purpose, an instrument is used which consists of a bent vulcanite tube, so arranged that by moving a slide a powder can be inserted and the orifice again closed.

It is usual to have the external end of this tube connected with a small indiarubber bag, which, when compressed, discharges the powder. This is for obvious reasons preferable to blowing through the insufflator with the mouth. Almost any of the various laryngeal insufflators will serve the purpose equally well: it is, however, essential in using the instrument to pass the nozzle well over the epiglottis and then to elevate the outer extremity so that the powder is directed into the larynx. In certain cases, too, it is necessary to direct the point towards an ulcerated surface over which it is desired to dust the remedy. In some cases it is possible for patients to do the insufflations for themselves, although it is, of course, preferable that the treatment should be carried out by a laryngoscopist. Alum, finely powdered, is a very useful astringent, while as antiseptics we may mention boracic acid, iodoform, iodol, and aristol.

It is sometimes desirable to apply *caustics* to the larynx, and of these nitrate of silver and chromic acid are most commonly employed. Either of these may be fused upon a roughened probe or a brush handle, and applied to the desired spot. Some authorities use guarded probes, which can be protruded by pressure on the handle, but, as it is undesirable that anyone who is not a thorough expert should employ these remedies, the method indicated is sufficient. I have not found frequent occasion to make use of either caustic. When they are employed, it is well to have at hand a spray of common salt water, or a solution of bicarbonate of soda, according as nitrate of silver or chromic acid is used, in order, if necessary, to stop the caustic action.

ELECTRICITY IN LARYNGEAL DISEASE.

It is often necessary to stimulate the laryngeal muscles by means of electricity. In such cases the induced current is the form usually employed. Probably the best method of *external* *application* is to place the electrodes on each side of the larynx and upper part of the trachea, as advised by Chiari.

If, however, this be insufficient, the endolaryngeal electrode is called into requisition. The patient is fitted with a collar having a plate for connection with one pole of the battery. The other pole is attached to Morell Mackenzie's endolaryngeal electrode. This is adapted for introduction into the interior of the larynx, and so arranged that the conducting wire is isolated by hard rubber, while the current can be turned on at will by pressing a spring. The instrument is commonly introduced so that the metal point rests between the arytenoid cartilages, and then the current is allowed to pass by pressing the spring with the forefinger. Von Ziemssen and others recommend a double electrode for certain cases, and in this way both poles are inserted into the interior of the larynx, and the action of the current can be more definitely localised; this is, however, rarely, if ever, required.

Electricity, in the form of the *electric cautery*, may, in certain cases, be extremely useful as a means of operating on the larynx. The instruments now commonly used are those of Schech, and the *modus operandi* has already been discussed in the section devoted to therapeutics of the pharynx. All the precautions there described are doubly necessary when the cautery points are used to destroy small neoplasms. I have, so far, only used the snare in order to sever the attachments of large tumours.

Electrolysis has also been employed, but it is unlikely to attain a permanent place in endolaryngeal surgery.

METHODS OF ATTAINING ANÆSTHESIA OF THE LARYNX.

It is unnecessary to describe antiquated and dangerous means of procuring loss of sensibility when we have in cocain a comparatively safe and reliable method. It is true that in a very few persons such small quantities as are used in applications to the nose and throat produce giddiness, faintness, and even sickness, sometimes followed by an apathetic listless condition; such accidents are, however, so rare, and have hitherto proved so harmless, that they need not act as deterrents. If it be desired to obtain very complete anæsthesia of the larynx I should advise the use of a spray of a 10 p.c. solution to be employed for about a second. Afterwards a brush dipped into a 20 p.c. is passed into the larynx, where it is applied not too gently; another such application may, if required, be made, but often this is unnecessary. For slight and easy manipulations the spray alone is usually sufficient. Before attempting any very delicate operation it is usually desirable to accustom the patient to the presence of instruments in his throat by introducing a laryngeal probe every day for some time before the operation.

ENDOLARYNGEAL OPERATIONS.

(1.) *Forceps.*—In endolaryngeal surgery forceps are probably used more frequently than any other instrument. In this country those known as Mackenzie's are usually employed, and consist of two main varieties,—cutting and tearing. As the former may be used to fulfil the functions of the latter, the practitioner, unless he be a specialist, may content himself with the possession of instruments whose laryngeal extremities are shaped like two sharp spoons. In Mackenzie's forceps the laryngeal extremity, which is set to the main body of the instrument at a curve approaching a right angle, varies in length, so that at least three sizes are required; further, two instruments of each size are necessary, one opening laterally and the other antero-posteriorly. An objection to this apparatus is its large bulk, so that at the moment of operating the parts are liable to be concealed; on the other hand, its strength is most useful when it is desired to remove a piece of infiltrated tissue for microscopic examination. Another drawback is that the hand is liable to get in the way; this objection has been obviated in the instruments devised by Hodgkinson and

Gottstein. The latter has his forceps made in such a way that by means of a wire running in a tube the blades only open near the extremity, and, owing to the leverage, little exertion is required to accomplish this.

Quite a number of small and delicate forceps have been made, but—when this class of instrument is desired—those known as Schrötter's will probably be found sufficient. In these instruments the handle and the forceps, which are closed by pulling them into the tube, were originally devised by Türck. To Schrötter is to be credited the forceps which are closed from below upwards, and together with these can be purchased guarded knives (one sharp-pointed and the other rounded) also capable of adjustment to the common handle, as well as a guarded caustic carrier.

(2.) *Knives.*—The guarded knives just mentioned will probably be found sufficient for most requirements. Some authorities prefer cutting instruments to be uncovered, but unless the manipulator be very skilful they are not to be recommended.

(3.) *Snares.*—These instruments are occasionally useful in removing pedunculated growths of soft consistence. When much resistance is anticipated, however, I prefer to use the wire heated by electricity rather than the so-called laryngeal écraseurs. When a simple snare is required that known as Tobold's is the form commonly employed.

(4.) *Guillotines* specially constructed for the larynx are used by Stoerk.

(5.) *Curettes,* as employed chiefly by Heryng, have of late come into fashion, more especially in the treatment of phthisis laryngea. They may, however, also be used in the removal of small tumours

(6.) *The sponge used for operating purposes.*—Voltolini, i certain cases of soft tumours attached to, and projecting b tween, the vocal cords, recommended that a small spon firmly attached to a suitable handle, and further secured a thick thread winding round the handle, should be introdu into the glottis and roughly moved up and down.

growths were in this way either rubbed off or their vitality destroyed. I once employed this method with considerable success, but the spasm of the glottis was so great that for an appreciable time the sponge was firmly grasped between the cords, and I should attempt the procedure again only in an extremely docile and tolerant patient.

(7.) *Dilatation of Laryngeal strictures.*—As we shall see later, such strictures may necessitate the use of the electric cautery or knife. What concerns us here, however, is dilatation without destruction of tissue. For years the chief advocate of this method has been Schrötter. His catheters are of varying calibre, somewhat triangular on section, and furnished at the outer extremity with a tube directed downwards, the object of which is to prevent matter coughed through the instrument from flying into the operator's face. An instrument of suitable size is introduced after the larynx has been anæsthetised and left *in situ* for a time. The calibre of the catheters, and the period during which they are left in position, should be increased as progress is made, and as toleration becomes established. In cases where tracheotomy has already been performed, Schrötter employs tin plugs, introduced by the mouth, with the aid of the laryngoscope and a suitable hollow handle. The plug is attached to the handle, which is hollow, by means of a thread passed through it. When the instrument is *in situ* the string remains hanging out of the mouth, while the tin bougie fits into an opening on the upper side of the tracheotomy tube and is retained there by a special appliance. In strictures which are almost complete, Newman employs tupelo dilators in the following manner:—A sharp laryngeal probe is first forced through the stricture until it appears at the tracheotomy wound. Silk ligatures are then attached to its extremity and drawn through the stricture, and this process is repeated, a larger number of threads being employed each time, until an orifice is obtained of sufficient size to admit a dilator. This, after being waxed at one extremity, is then pulled through in the same way, the calibre of the tent being gradually increased. Finally, an artificial larynx is introduced so that the patient is enabled to use articulate speech.

In acute stenosis of the larynx resulting from croup, and occasionally in chronic stenosis, O'Dwyer advocates the insertion of a tube into the larynx. This method is practically a revival, in a modified form, of a method proposed by Bouchut. By means of a special director a short tube, having a bulging rim, and provided with an artificial epiglottis worked by a fine spring, is introduced into the larynx and left there. In the original tubes, constructed by O'Dwyer, there was no valve, and as a result there was for some days great difficulty in swallowing fluids. Waxham's ingenuity has, however, overcome this, in so far that when his tubes are employed, small quantities of liquid can be swallowed immediately, provided the head be inclined forwards. In cases of croup Waxham does not remove the tube for several days unless it is becoming obstructed. In order to remove the cannula a special extractor is employed. Space does not permit us to enter further into this question of intubation, but it is due to our American *confrères*, who have for years practised this method, to state that they claim for it results as good as those after tracheotomy in all cases of diphtheritic croup, and much better in children under the age of three years. Neither in this country nor on the Continent can intubation be said to have had a fair trial, although a number of cases have been recorded. Those who desire further information we must refer to Waxham's monograph on *Intubation of the Larynx*.

Before closing this section it will be well to refer briefly to *the mode of carrying out endolaryngeal operations*. In all cases—unless the operator be left-handed or ambidextrous—the mirror must be held in the left hand, the tongue is controlled by the patient while the instrument is introduced with the right hand.[1]

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[1] In intubation by O'Dwyer's method the laryngoscope is not employed, the tube being guided by the finger.

In operating it must be the aim of the surgeon to introduce the probe knife or forceps, so that the epiglottis is not touched. It will be evident to the reader that the *tactus eruditus* cannot be learned excepting by practice, which may be obtained either by the frequent introduction of a probe into the larynx of a tolerant patient or the employment of a phantom. Even the experienced laryngologist will often require to accustom a patient, upon whose larynx it is proposed to perform some delicate manipulation, to the presence of instruments by repeated *séances*, during which a probe is brought into contact with the part to be operated upon.

INTERNAL MEDICATION AND HYGIENE.

It is almost superfluous to remark that the administration of general remedies is frequently indicated in diseases of the throat. Mineral waters are often recommended in chronic affections of the mucous membrane, and no doubt in certain cases of laryngeal disease residence at a suitable spa is serviceable. In plethoric, gouty individuals a course of Carlsbad water, associated with regulated diet, may materially aid local remedies. The sulphur springs of the Pyrenees—especially Les Eaux Bonnes—enjoy a considerable reputation for the cure of throat affections, but it has lately been pointed out by French authorities that in laryngeal phthisis they are probably not only not beneficial, but directly harmful. Ems in Germany and Mont Dore in France are also favourite resorts for those afflicted with vocal troubles. It is difficult to ascribe to change of air, attention to hygiene, and mineral waters their respective merits in a case of chronic laryngeal catarrh which has been cured by the bath treatment.

There is no doubt that if we begin the application of local remedies in a patient who, from long residence in town, often associated with sedentary occupation and careless living, is run down in health, we start at a distinct disadvantage. In such a case it is, in my opinion, better to advise a holiday, and prescribe such remedies as the patient himself can employ, before resorting to measures which necessitate frequent applications by the laryngologist. With every faith in local treatment applied by an expert, I still believe that good general health should, if possible, be obtained as a working basis.

As to general hygiene, it is important to exclude irritants. Among these we may mention first and foremost excessive use of the voice, and it is sometimes necessary to enjoin that all conversation be carried on in a whisper. Exposure to excessively hot or cold air, or to an atmosphere containing dust or other impurity, must be forbidden, while highly-spiced food and drink must be avoided. Concentrated alcohol, such as spirits and the stronger wines, should, in my opinion, be looked upon as chemical irritants, while, unless contra-indicated on general grounds, claret, light hock, and beer may often be allowed. Smoking, if permitted at all, should take place in the open air only, and, of course, the fumes must not be inhaled. Now, to return to the question of health resorts, it is probable that a patient who takes the trouble, and incurs the expense of going to a spa, will pay more attention to his line of life than one who, while attending to his daily avocations, is submitting to local treatment, which he expects to cure him. For these reasons it seems to me that specialists have somewhat under-estimated general and over-estimated topical treatment; and, further, I believe that under certain circumstances it may be well to begin by ordering change of air, and if the means of the patient permit it, a course of hydropathic treatment at a resort suitable to the case. In many persons with a catarrhal tendency, as every practitioner is aware, regular bathing in cold or tepid water, followed by friction, is extremely useful, and in this fact we have another possible explanation of the beneficial effects of mineral waters. In those who are able to use a cold bath without feeling chilled this should be carried out every morning. Persons who are less robust may employ tepid water, followed by friction with a hard towel or flesh brush.

CHAPTER III.

ACUTE INFLAMMATIONS OF THE LARYNX.

ACUTE CATARRHAL LARYNGITIS.

THIS is the affection so familiar to most persons as a form of catching cold. The patient may have suffered from pharyngeal catarrh in the first place, which has extended downwards to the larynx, whence it may pass on to the trachea and bronchi. Sometimes, too, the vocal apparatus is involved by extension from below upwards. Not uncommonly the larynx is attacked first and alone—no extension taking place in either direction. The advent of laryngitis may be preceded by a slight chilliness, but often hoarseness is the *symptom* which first calls attention to the throat. After a time there is a subjective sensation of rawness associated with the feeling of a foreign body, which causes frequent attempts to clear the throat. Little or no expectoration follows these efforts at first, but afterwards small pellets of mucus may be ejected. The amount of vocal disturbance varies from huskiness to aphonia. Pulse and temperature are usually not appreciably elevated, although occasionally the former may be quickened and the latter reach 101°, or even more.

If we investigate the *causes* of this affection we find exposure to cold, the local action of irritants, whether contained in the air or food (dusty atmosphere, over-indulgence in alcohol or tobacco), the rheumatic habit, and excessive use of the voice to be frequent factors. A previous attack, too, may render the sufferer more prone to be again affected.

Laryngoscopic examination shows the larynx to be congested either as a whole or in part. This is usually most evident in the vocal cords, which are commonly of a distinctly red colour.

On phonation they are often seen to leave an elliptical space between them, due to insufficient action of the internal tensors, or thyro-arytenoid muscles. Loss of voice may, however, also be due to swelling of the mucosa between the arytenoid cartilages. Little or no excess of secretion is found in most of these cases on examination with the mirror.

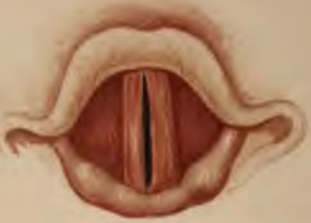

FIG. 3.—Acute catarrhal laryngitis.

Modifications of Acute Catarrhal Laryngitis.—Sometimes the epiglottis only is attacked, and this condition has been described as *angina epiglottidea.* The voice is then clear, but there is the sensation of a foreign body in the throat, and marked pain on deglutition; and on examination the epiglottis is seen to be inflamed and swollen.

A few cases of *hæmorrhagic laryngitis* have been described, some of them associated with the recent epidemic of influenza. In these there are present symptoms of catarrh, associated with the expectoration of blood. I have only seen one case of this kind; examination revealed congestion of the larynx and a bleeding point near the anterior commissure. Occasionally submucous extravasations of blood occur in the larynx, and the ecchymoses can be seen by laryngoscopic examination.

In rare cases the swelling of the mucosa is associated with the presence of small vesicles, so that an appearance analogous to *herpes* is produced. Cases have been recorded where herpes was at the same time present on the face. Shedding of the laryngeal epithelium in patches has been observed by Symonds and Landgraf in *pemphigus*, but neither of these authors seem to have detected the presence of bullæ.

Laryngitis sicca is an affection in which the discharge from the inflamed mucous membrane tends rapidly to dry up, with the result that the cords are more or less covered with crusts. Gottstein and others describe an acute form of this affection; but in my experience it is more commonly chronic. Its symptoms will, therefore, be more fully described when discussing chronic laryngitis.

When acute laryngeal catarrh occurs in childhood its symptoms are considerably modified, giving rise to what has been termed *pseudocroup*. The child is perhaps slightly hoarse during the day, or may occasionally give forth a ringing laryngeal cough. At night, however, it wakes up with embarrassed breathing, while the cough is also more troublesome. The dyspnœa is always worst just after waking, and is probably due to an accumulation of mucous in the larynx during sleep. Some authors—notably Rauchfuss and Moldenhauer—claim to have seen marked sub-cordal swellings in these cases of so-called pseudocroup, which both form and disappear rapidly. I cannot help thinking that much of the dyspnœa is due, in some instances at least, to the presence of associated nasal and pharyngeal catarrh, the secretion thus produced accumulating in the larynx, and often giving rise to spasm. In all forms of acute catarrh the *prognosis* is favourable.

The *treatment* of acute laryngeal catarrh is in most cases a simple matter. The patient should be kept in a warm room, or in bed if the temperature be raised, and directed to use his voice as little as possible. A cold water compress, surrounded by oiled silk, is placed over the throat, while a diaphoretic may be administered at bed-time. The voice should be used as little as possible, and the tendency to clear the throat repressed. The inhalation of steam medicated with compound tincture of benzoin (ʒi. to a pint) is grateful to the patient, while cough, if present, may be subdued by an opiate, cocain spray (5 per cent.), or menthol pastilles ($\frac{1}{4}$ gr. in each). Sucking pieces of ice may be employed for the same purpose, while drinking hot milk, with equal parts of seltzer water, is a common German remedy. If a rheumatic element is suspected salicylate of soda or salicin may also be given.

In the *croupy laryngitis* of children it is better to place the patient at once in a tent supplied with steam from a suitable kettle. Small quantities of ipecacuanha wine may be given in hot water and sugar, while other warm drinks, such as milk and seltzer water, are often of use in relieving cough. It is now usual to condemn the administration of emetics, but the fact remains that the anxieties of parents, and the discomforts of the little patient may often be at once cut short by the exhibition of a teaspoonful of ipecacuanha wine repeated, if necessary, until vomiting is induced. It must be remembered that in the first attack of catarrhal laryngitis it is often very difficult to distinguish this innocent affection from the deadly diphtheritic form, unless a laryngoscopic examination be practicable. It may therefore, in doubtful cases, be safer to use a non-depressing emetic, such as sulphate of copper or zinc.

In inflammation confined to the epiglottis, sucking ice, bland diet, and avoidance of irritants are indicated; while, if the part be very much swollen, it may be scarified in order to relieve tension and avoid dyspnœa. In such cases the possible presence of a gouty diathesis should be borne in mind, and, if necessary, treated.

In hæmorrhagic laryngitis astringent sprays (*e.g.*, perchloride of iron gr. iii. or more, ad ℥i.) may be necessary, while rest of the voice must be strictly enjoined.

ACUTE ŒDEMA OF THE LARYNX.

We must begin this section by directing attention to the fact that œdema of the larynx may be either inflammatory or non-inflammatory. For the sake of convenience, however, both forms will be discussed here.

(1.) *Non-inflammatory œdema.*—Laryngeal œdema may exist as part of a general dropsy due to renal or cardiac disease. Further, it may owe its origin to the pressure of cervical or mediastinal tumours on the large veins. It is also worthy of note that in rare instances of renal disease the larynx has been the first part to show œdema. Fournier, Rosenberg, and others have described cases in which laryngeal œdema followed the continued use of iodide of potassium, and although this is rare the possibility should be borne in mind.

A very curious and interesting form of acute œdema has been described by Strübing, who considers it an angioneurosis. *Angioneurotic œdema* begins either without traceable cause, or follows exposure to cold, or partaking of very hot or cold food. Discomfort on deglutition, with redness and swelling of the uvula, are soon followed by œdema of these parts, which extends to the epiglottis, ary-epiglottic folds, and false cords. The whole development occurs in less than three hours. After the laryngeal œdema has disappeared the same condition appears on the face and thorax; occasionally the progress of events is the reverse, beginning with œdema of these parts. The whole process is characterised by the absence of fever.

The leading *symptoms* are huskiness or aphonia and dyspnœa, which is usually inspiratory, while the laryngoscopic characters are similar to those of the inflammatory form of œdema with the exception of colour, the swollen parts being usually considerably paler. The *prognosis* depends partly on the amount of dyspnœa and also upon the primary cause of œdema.

The *treatment* must be conducted on general principles. Diuretics, hydragogue cathartics, and diaphoretics are, of course, indicated in cases where the œdema is the result of renal or cardiac disease. The special treatment of such cases comes, however, within the scope of works on Practice of Medicine. The subcutaneous injection of pilocarpine was found successful in a patient observed by Gottstein in whom the laryngeal œdema depended on Bright's disease.

In the angioneurotic form Strübing recommends sucking ice, morphia internally, and scarification if the dyspnœa be marked. Numerous small incisions of the dropsied parts should also be made in the other forms if suffocation is threatened, while tracheotomy may of course be required. If œdema depends on pressure the cause should be removed if practicable.

(2.) *Inflammatory Œdema.*—Before discussing the various sub-varieties, it will be well to give a general account of the laryngoscopic appearances. If the œdema be general, the epiglottis, ary-epiglottic folds, and ventricular bands will be much swollen and of a red or yellowish red colour. The epiglottis may assume the shape of a globular mass, or its appearance may be more that of two sausage-like bodies pressed together. The ary-epiglottic folds are often swollen, so that they almost meet in the middle line, concealing all other parts from view. The œdema may, however, be limited to certain parts, as, for example, the lax tissue beneath the cords. Laryngoscopic examination then reveals two masses, one under each cord, projecting into the subglottic space.

In extreme cases of general laryngeal œdema, where the mirror cannot be employed, the swollen parts, especially the epiglottis, can be felt by introducing the finger. Acute inflammatory œdema must be discussed under several headings, according to its etiology.

In all cases the *prognosis* is grave, and in this respect each case should be judged upon its merits. Primary or septic laryngitis is more serious than the forms arising from purely local causes.

(*a*) *Acute Primary Œdematous Laryngitis.*—It is often assumed that simple neglect of an ordinary laryngeal catarrh may turn the mild into the deadly affection. Morell Mackenzie, however, pointed out years ago that the œdematous form occurs most commonly in those who are exposed to septic influences. More recently, Massei and Fasano both stated their belief that these cases are in reality erysipelas of the larynx, and the latter actually demonstrated the presence of Fehleisen's micrococcus.

In this affection there is marked fever, while the throat symptoms very soon assume dangerous prominence. Hoarseness and discomfort on deglutition soon give place to pronounced dyspnœa, while examination of the larynx reveals marked inflammatory swelling.

In some cases—whether due to septic influences or not—the inflammatory œdema is confined to the subglottic tissues—*laryngitis hypoglottica acuta.* The laryngoscope then reveals the presence of a tumefaction below each vocal cord.

Rarely acute œdematous laryngitis terminates in the formation of an *abscess.* There is then marked pain in addition to hoarseness and dyspnœa, and the laryngoscope reveals a more or less localised redness and swelling. Occasionally a yellow point may be noticed where the abscess wall is threatening to give way.

The *treatment* of œdematous laryngitis should be energetic. If we assume the septic, and probably the erysipelatous, nature of the affection as proved, then the administration of quinine, and especially the tincture of the perchloride of iron in large doses are indicated. The application of leeches to the exterior of the larynx, followed by icebags and the internal administration of pieces of ice, are usually advocated. I question, however, whether in many instances moist warmth, as supplied by an atmosphere of steam, would not prove more effective. In all cases, if practicable, scarification should be practised when dyspnœa is urgent. If a localised abscess be suspected, early incision is, of course, indicated, care being taken to throw the head forward the moment pus begins to appear. The fact remains, notwithstanding all this, that most of these cases require tracheotomy, and it must further be borne in mind that it is better to operate too early than too late. Whether intubation would be of value in some instances has not yet been determined; the question must, of course, resolve itself into whether the tube in contact with the inflamed tissues would be less hurtful than the wound necessary to reach the trachea in such cases as are erysipelatous.

(*b*) *Acute Secondary Inflammatory Œdema.*—In this form the œdematous inflammation may arise from various causes. Sometimes a pharyngitis, probably septic or distinctly erysipelatous, is followed by laryngeal œdema. Injuries of the larynx, whether caused by mechanical (*e.g.*, foreign bodies), thermal, or chemical irritants, may be the exciting causes. In not a few instances, inflammatory swelling has its starting point in a syphilitic or phthisical ulceration; indeed, it is quite common to have a localised œdema from either of these conditions. Inflammations in the neighbourhood of the throat, *e.g.*, parotitis, phlegmon of the neck, and the like, may be followed by extension to the larynx.

As in the other forms of œdema, interference with the voice and respiration are the leading *symptoms*. The *prognosis* is always grave, and most serious in the septic form.

As to *treatment*, the general indications are the same as in the preceding variety. Quinine and iron should be given where sepsis or erysipelas is suspected. Iodide of potassium and mercurial inunctions should be employed in cases resulting from syphilitic ulcers. The internal or external use of ice on the one hand, or the saturation of the atmosphere of the sick-room with steam, may be employed, according to the individual judgment of the practitioner. At all events, scarification should be practised early, and tracheotomy not delayed if dyspnœa be urgent.

DIPHTHERITIC LARYNGITIS OR CROUP.

It is extremely probable that most cases of fatal croup are in reality diphtheritic. It has, however, also been proved definitely that under certain conditions, such as irritation by chemicals and obstruction to the venous circulation, a non-diphtheritic membranous laryngitis may arise.

Croup is a disease of childhood, being most common between the ages of two and seven. In most cases the child suffers from malaise and catarrh before the actual development of the false membrane. Even at this stage, however, small hoar-frost like patches may be detectable by means of the laryngoscope. Not uncommonly, too, careful inspection of the fauces will reveal the presence of whitish-yellow deposits on some part of the pharyngeal mucosa. The febrile disturbance—as indicated by a rise of temperature and pulse rate—usually becomes marked; sometimes, however, fever is not very prominent in cases in which the disease is confined entirely to the larynx. The characteristic "croupy" cough with some huskiness is early present. After a time, paroxysms of choking and increasing dyspnœa indicate the spread of false membrane. *Pari passu* the voice becomes more and more husky, or quite aphonic. Gradually the dyspnœa grows more constant, the child makes frenzied clutches at its throat, and the lips assume a bluish tint; unless tracheotomy or intubation be performed, death now speedily terminates the scene of suffering—the average duration being from six to eight days.

There can be no doubt that in the early stages of membranous laryngitis it is difficult, if not impossible, to *diagnose* between it and the catarrhal form, especially a first attack of the latter. In a child who habitually gets simple laryngitis, the presumption will be in favour of the milder and more common ailment. In the later stages of true croup the diagnosis is easily made. Of course the laryngoscope will determine the question; at the same time it seems to me of questionable propriety to use this method of examination when it can only be carried out by subjecting the patient to the risks which must necessarily accrue from cries and struggles.

As complications, we may mention extension of the disease to the trachea and bronchi, and the appearance of pneumonia.

The *prognosis* of true croup is extremely grave. Morell Mackenzie estimates the recoveries as low as 10 per cent. in cases in which tracheotomy is not performed, and considers that by the practice of this operation they may be raised to between 40 and 50 per cent.

As to *treatment*, we must refer to the section on pharyngeal diphtheria, and content ourselves with a few additional remarks. Local bleeding by means of leeches may be of service in the early stages, and the internal and external application of cold is then also of value; these indications may be met by the use of ice-bags and sucking pieces of ice. When severe dyspnœa sets in, an emetic should be administered with the hope of throwing off obstructing shreds of false membrane. The patient ought, as soon as possible, to be placed in an atmosphere of steam, and to this may be added an antiseptic, either by mingling it with the water, or by burning sulphur in the room at the same time. If the child be old enough, the throat may be sprayed either with an antiseptic (*e.g.*, carbolic acid, gr. iii. ad ℥i., or corrosive sublimate 1-2000) solution, or one of the solvents of false membrane (lime-water, diluted lactic acid). Morell Mackenzie attempts to remove the false membrane with a brush made of squirrel's tail; while Gottstein advises the injection of lime-water by means of a laryngeal syringe. I suspect that most practitioners will agree with me in considering these remedies too heroic, not to say terrifying, for the class of patients who are the usual victims of croup—young children.

There can be no doubt that in a number of cases surgical aid will be required. From Waxham's statistics, and from the great success which has attended O'Dwyer's method in America, there can be little doubt that intubation is tending to supersede tracheotomy—especially in America. Probably the last-named operation will, however, continue to hold its own for a time. The general opinion among those who have had experience in intubation seems to be that it is decidedly preferable in the case of children under three years of age. Whichever method be chosen, it should be practised whenever the dyspnœa cannot be relieved by other means and while the general condition is still good.

INFLAMMATION OF THE LARYNX IN ACUTE FEVERS.

The existence of laryngeal erysipelas has already been referred to.

In *measles* some degree of laryngeal catarrh is a usual phenomenon at the beginning of the disease. Sometimes, however, it is so severe at this period as to simulate true croup. Membranous laryngitis may, however, also occur as a complication of measles, and West states that it is most commonly met with as the rash begins to decline. According to Löri, the laryngeal catarrh of measles is associated in about half the cases with a macular redness of the parts, seen when the patient is examined with the laryngoscope.

In certain epidemics of *scarlatina* there seems to be a special tendency for the larynx to become involved. Rauchfuss, quoted by Gottstein, found in 903 cases of scarlet fever, 2 instances of pharyngo-laryngeal diphtheria, 3 of croupous inflammation of the larynx and trachea, and 8 of œdematous laryngitis. Membranous laryngitis occurring in the course of scarlatina is always very serious—more so than in the idiopathic variety—as in addition to the risk of suffocation there is a strong tendency to ulceration of a very destructive character, which may lay bare cartilages and erode blood vessels.

In *small-pox*, laryngeal inflammation is a very common phenomenon—so common, indeed, that it is seldom absent. According to Wagner, the occurrence of pustules in the larynx is also frequent; but other authorities seem to have met with them only occasionally. They may lead to ulceration, perichondritis, and even œdema. Variola may also give rise to catarrh and to a form of membranous laryngitis, which, fortunately, runs a much milder course than other forms of croup; but, as Gottstein observes, this probably depends in part upon the character of the epidemic.

In *typhoid fever*, laryngeal catarrh is often met with, and, according to Morell Mackenzie, secondary diphtheria is not uncommon, although often masked by the prostrate condition of the patient. The most characteristic condition is, however, infiltration, leading finally to ulceration. The parts most liable to be thus attacked are the under surface of the epiglottis, the ventricular bands, and the inner surfaces of the arytenoids. These ulcers have, in many instances, a tendency to spread; in other cases, however, they heal readily. Deformities, adhesions of various kinds, with subsequent stenosis, perichondritis, and œdema may result from typhoid ulceration, and the practitioner must be on his guard not to consider such cases syphilitic. It is characteristic of laryngeal disease in the course of typhoid fever that marked destructive changes may occur without corresponding subjective sensations, and during the course of the fever laryngoscopic examination is naturally difficult.

In *typhus fever*, laryngeal complications are not common, although laryngeal catarrh, with or without œdema and diphtheria, are occasionally met with. Where ulceration has been observed, the loss of tissue seems to have been due either to the severity of the inflammation or to have occurred as a direct result of a diphtheritic process.

In *glanders*, the larynx may be the seat of nodules of yellowish colour and ulcers. In exceptional instances, where recovery has ensued, contracting scars have been observed as a sequel.

In *influenza*, as we have seen, hæmorrhagic laryngitis is sometimes met with, while catarrh going on to ulceration has also been described.

The *treatment* of the laryngeal complications occurring in the course of acute fevers must be conducted on the general principles already laid down, attention being, of course, given to the general condition of the patient in considering the propriety of local interference.

In *whooping cough*, laryngeal catarrh is an almost constant phenomenon. Occasionally, if the paroxysms of coughing be very severe, hæmorrhages or extravasations occur in the larynx. As a rule the catarrh is slight, but cases of œdema have, according to Gottstein, been frequently observed. The same author also states that diphtheritic laryngitis is a rare, but—when it does occur—usually a fatal complication. With the general treatment of the disease we have nothing to do in these pages; but it may be mentioned that the application of cocain to the larynx has been stated to lessen the frequency of the paroxysms and diminish their violence. The insufflation of powders into the nose as a means of relieving whooping cough was first suggested by Michael. This author employed a mixture of powdered benzoin and quinine, but others seem to have had equally good results with various, and even more indifferent, substances.

PERICHONDRITIS OF THE LARYNX.

Although extremely rare there can be no doubt that primary inflammation of the perichondrium does occasionally occur. As proof of this may be cited cases which have recently been published by Newman and Jurasz. Perichondritis may arise from injury either direct, as in cut-throat, &c., or indirect, as when it results from the impaction of a foreign body. Von Ziemssen believes that in elderly people the frequent introduction of an œsophageal bougie is liable to cause inflammation of the perichondrium of the cricoid cartilage.

The most common cause of disease of the cartilage is, however, tubercular ulceration of the larynx, and syphilis must be classed next in frequency. Typhoid fever, variola, and scarlatina too, may, when they attack the larynx, lead to this affection, while Schrötter also includes among its etiological factors erysipelas and pyæmia (including the puerperal form). In the later stages of malignant disease also, inflammation of cartilage is of common occurrence.

Although perichondritis is usually a suppurative process, which begins with acute symptoms, and finally—if life be sufficiently prolonged—leads to exfoliation of the subjacent cartilage, there is now every probability that in certain cases the acute signs and symptoms are wanting. The occurrence of *chronic anchylosis of the arytenoid cartilage* has received special attention from Semon, who has collected all the published cases up to 1880, and added a number of his own observations.

The *symptoms* of perichondritis are by no means characteristic. The most constant is pain, increased by external manipulation of the larynx if the cricoid or thyroid cartilages be affected. If the epiglottis be involved deglutition will be painful, while the same is true in perichondritis of the arytenoids; and, in the last-named form, phonation may be attended with acute suffering. Occasionally the actual presence of necrosis may be demonstrated by the expectoration of fragments of cartilage, while, in most cases, both hoarseness and impeded respiration are conspicuous symptoms.

Of all the laryngeal cartilages the arytenoids are most often attacked; this fact being easily accounted for by the frequency with which tubercular ulcers are situated in their neighbourhood. In the suppurative variety of arytenoid perichondritis there is marked swelling over the affected cartilage, and finally pus forms and discharges either at the apex, or, more frequently, near the vocal process. Through the opening thus produced pieces of cartilage may be exfoliated, while the condition may be further investigated by the introduction of a probe.

In fixation of the arytenoid cartilage, due to chronic perichondritis or healed ulceration, it is often difficult, and sometimes impossible, to differentiate this condition from paralysis of the vocal cord. According to Semon, "the presence of tumefaction about the bases of the arytenoid cartilages, evidence of other cicatricial contraction in other parts of the larynx, and the results of different methods of treatment, may, in such cases (especially where there is a specific history), establish the diagnosis; in other instances, however, the true nature of the case will only appear *post mortem*."

In perichondritis affecting the cricoid, the swelling may, according to circumstances, involve the ary-epiglottic folds, the posterior laryngeal wall, the external surface of the larynx towards the pyriform sinus, or it may be most pronounced in the subglottic region. This form may readily lead to marked laryngeal stenosis.

When the thyroid cartilage is involved on its internal surface, a swelling beneath the anterior commissure is liable to occur, and this may extend so as to produce tumefaction beneath the vocal cords. If the external surface be affected, the pus will, of course, tend to point outwards, and thus lead to an abscess in the neck.

The *prognosis* of perichondritis must in part depend upon that of the primary disease. At the same time, suppurative perichondritis with necrosis is a most serious complication in any case, because, even if the disease itself be so far recovered from, cicatricial stenosis of the larynx is likely to remain.

The form of perichondritis which is most amenable to *treatment* is that which is secondary to syphilitic disease of the larynx. In such cases, it need hardly be said that iodide of potassium should be administered internally in large doses, beginning with fifteen grains thrice daily, and increasing the amount; while inunction with mercurial ointment should also be practised.

In all cases the external application of cold and sucking ice are indicated, while iodine painted over the outside of the larynx may also be serviceable. Scarification of the endolaryngeal swelling is a form of treatment calculated to relieve alike pain and tension, while a yellow appearance indicates an incision for the evacuation of pus; such an incision should be made rapidly, and the head immediately afterwards thrown forwards to facilitate expectoration of the discharged matter.

In many cases tracheotomy is required to prevent death from suffocation. After a sub-perichondrial abscess has begun to discharge, tonics and nourishing diet must be given, and when convalescence — which is, unfortunately, rarely attained — has become established, the patient must be kept under observation, so that a tendency to cicatricial stenosis may be obviated by the use of Schrötter's bougies.

In certain cases—not depending upon a hopeless dyscrasia—in which exfoliation occurs slowly, and the patient's life is threatened by exhaustion and septic pneumonia, it may be advisable to consider the propriety of opening into the larynx from without (laryngotomy) and removing carious fragments of cartilage.

In *chronic fixation* of the arytenoid it will probably be well to abstain from *treatment* if the affection be unilateral. In cases, however, where the condition is bilateral, the vocal cords are liable to assume a permanent condition of adduction, and thus dyspnœa is produced. Tracheotomy may then become necessary, but Schrötter prefers to use dilatation by means of bougies, and it is not improbable that intubation may also prove effective in these instances.

CHAPTER IV.

CHRONIC INFLAMMATIONS OF THE LARYNX.

Chronic Laryngeal Catarrh.

Chronic catarrh of the larynx is most commonly met with in those who are forced to use their voices as a means of livelihood. Perhaps next in frequency to habitual vocal effort as a cause, we may consider much time spent in impure air, *i.e.*, air which has dust or irritating particles suspended in it. Excessive use of alcohol and tobacco, too, must be looked upon as etiological factors, while the habitual use of highly spiced diet may come under the same category. Whether or not there be a specialised gouty form of chronic laryngitis, there can be no doubt that in certain persons of plethoric habit limited diet, abstention from alcohol, and the administration of Carlsbad salt materially hastens recovery, as pointed out by Von Ziemssen. Chronic catarrhal laryngitis of extreme obstinacy may also exist for a time as the precursor of laryngeal phthisis. It is hardly necessary to add that a neglected acute catarrhal laryngitis may eventually become chronic; while persistent nasal and pharyngeal catarrh may lead to secondary laryngitis.

The most prominent *symptom* of chronic laryngitis, as it usually occurs, is vocal disability, varying in degree. Sometimes the voice is only easily fatigued, while in other cases there is more or less constant huskiness. Local pain is not commonly complained of, although a constant inclination to clear the throat is at times a prominent symptom.

Examination with the laryngoscope shows congestion and hypersecretion, sometimes also thickening of various parts. Congestion is often most marked, or perhaps we should say is most easily detected, on the vocal cords. These are either uniformly reddened or the hyperæmia may be more localised. Thus it is not uncommon to see only the posterior portions congested. Sometimes the distended vessels do not give rise to a very definite red tint, but the cords look thicker and more flabby than in the normal larynx, while the colour is of a dull grey, seen on close inspection to be relieved here and there by ramifying arterioles. The amount of secretion varies, but occasionally it may be observed stretched between or lying on the vocal cords in tenacious masses.

Actual thickening, both of the vocal cords and ventricular bands, may result from long-continued chronic catarrh. Occasionally the epithelium tends to become slightly eroded on the free margins of the cords, and in the inter-arytenoid commissure, but I have never seen a definite ulcer due to catarrh alone. Where superficial ulceration takes place, phthisis should be suspected; for the ulcerations of syphilis, carcinoma, and lupus are not likely to be confounded with catarrhal laryngitis. While making this statement, I have no desire to disparage the testimony of Schnitzler and others, who have observed catarrhal ulceration; but the experience of most laryngologists in this matter seems to be in accord with my own.

As in acute, so in chronic catarrh, it is by no means uncommon to see paresis of the internal tensors of the vocal cords, a condition characterised by the elliptical space left between the cords on attempted phonation. In many cases this is absent, and the vocal disability is due to thickening of various parts, *e.g.*, the cords, the inter-arytenoid mucosa preventing proper approximation.

The *prognosis* of chronic laryngitis is influenced by the degree of infiltration and congestion, but also by the social position of the patient. If the sufferer be able to save his voice, avoid irritating atmosphere, and generally to attend to instructions, the laryngitis will usually yield to treatment.

Before discussing treatment, it may be well to consider some of the sub-varieties of chronic laryngitis.

In certain cases, in which the victims are often vocalists, the larynx looks almost normal, but the mucosa throws out an excessive amount of secretion whenever the patient attempts to sing. This form of laryngitis is known as *laryngorrhea.*

Laryngitis sicca is by no means uncommon. The patient complains that she—for this affliction is more common in women—is quite aphonic on first waking; sometimes there is also a certain amount of dyspnœa. Both of these symptoms, however, are relieved after a violent fit of coughing has expelled some small hard pellets. On examining such a case, we usually see that the vocal cords are more or less congested, and have adhering to their surface small dry crusts of mucous. It goes without saying that the laryngoscopic appearances vary according to whether the examination takes place just after a fit of coughing or not.

A form of laryngitis sicca has been observed by Baginsky, in which the crusts extend also into the trachea and emit an offensive odour. For this reason, and because the condition occurred most frequently in those who had atrophic catarrh of the nose and naso-pharynx, he named it "*ozæna laryngis.*"

As "*blenorrhea of the nose, larynx, and trachea,*"[1] Stoerk described an affection similar to this, but ending frequently in adhesion between the anterior portions of the vocal cords. As Schrötter pertinently remarks it is probable that two classes of cases are considered under this name, viz. (1) ozæna laryngis; (2) an affection analogous to rhinoscleroma.

As results of long-continued catarrh, circumscribed thickenings may occur in certain areas. Thus the epithelium around the vocal processes may undergo excessive development, and give rise to the condition described by Virchow as *pachydermia*

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[1] This disease, according to Stoerk, is chiefly, if not only, met with in Galicia, Poland, Wallachia, Bessarabia.

laryngis—an affection which is rarely met with except in middle-aged males who are usually addicted to alcoholic excesses. Again, a localised thickening may take place on the vocal cords (often bilateral, and situated at the junction of the posterior two-thirds with the anterior third), and is spoken of as *trachoma*, or *corditis tuberosa*. A *granular laryngitis*, also called *glandular laryngitis* has been described, in which there are scattered here and there small elevated red patches; this form is, by some writers, thought to be analogous to granular pharyngitis.

In the *treatment* of chronic laryngitis one of the most important therapeutic indications is rest of the voice, and unfortunately this is just where the laryngologist is often met with the statement that it is impossible. However, no feelings of sentiment should induce the physician to conceal the fact that in order to effect a cure rest is paramount. If the laryngeal catarrh be traced to dusty atmosphere this must be remedied, and all excesses in alcohol or tobacco interdicted. It is of importance that nothing should be taken which in passing over the larynx may mechanically irritate it—thus strong alcohol (port, sherry, and spirits, unless much diluted), are to be eschewed. Highly spiced articles of diet come under the same prohibition, while smoking in a room must be forbidden, although a pipe or cigar in the open air may be permitted provided the smoke be not inhaled.

If the patient be in rude health we must at once pass to local treatment, but if anæmia, nervous exhaustion, or gout be present, then suitable general remedies must be combined with it. It is common among throat specialists to decry the value of health resorts in chronic laryngitis, and to trust either entirely to local applications, or at most to employ general remedies at the same time. As I have just stated this seems the course indicated in the case of strong patients living under perfect hygienic conditions, but many of those who seek our aid are persons who live in the turmoil of city life, and are engaged more or less actively in the struggle for existence. It seems to me that whenever in such a patient a want of tone is detectable, be it evidenced by anæmia, neurasthenia, or dyspepsia, it is desirable to brace up the system generally, and further, that a change of air, by necessitating abstention from business cares, is the best means of effecting this. If the patient's means be such as to admit it, there is no reason why a health resort should not be selected, and experience points, as suitable localities, to Ems, Eaux Bonnes, Cauterêts, Mont Dore, &c., where the action of the natural waters is beneficial in catarrhal conditions. It is a matter of every year personal experience to most medical men that a holiday and change of scene are conducive to greater well being, even although the individual may have been organically healthy before. In the case of a person suffering from chronic laryngeal catarrh it will, however, be well to choose a spot with as mild a climate, and as equable a temperature, as circumstances permit. In order to avoid being misinterpreted, I must repeat, that while I by no means believe change of air to be indispensable in the treatment of chronic laryngitis, yet I consider it a valuable beginning of treatment in overworked persons. It seems almost a truism to say that any chronic inflammation can be more easily cured in a robust than in a debilitated patient. In chronic laryngitis it is of importance that the patient should avoid as much as possible inhaling cold or foggy atmosphere, and Morell Mackenzie advises the employment of a respirator when atmospheric conditions are unfavourable.

To turn to local medication, the most simple, and perhaps at the same time the least effectual method, is by means of steam inhalations. Probably the best of such inhalations is the following:—

℞.,	Oil of Pine, . . .	40 minims.
	Light magnesia, . .	20 grains.
	Water to . . .	℥ i.

A teaspoonful in a pint of water at 140° for each inhalation (London Throat Hospital Pharmacopœia). Schrötter considers that oil of turpentine, of which a few drops (up to 20) may be added to warm water, is equally efficacious, while eucalyptus oil, or oil of pumiline, may be used in the same manner. It is of importance to make the patient refrain from exposure to cold air for half an hour after each inhalation.

Of far more value than steam, medicated with infinitesimal proportions of volatile oils, are applications made by means of a spray. This form of treatment has the advantage of being capable of use by the patient at his own home, and I would always suggest its employment for a time before the sufferer is subjected to the inconvenience of daily applications made by the physician. The remedies which are most useful as sprays are—tannin (gr. iv.-x.); alum (gr. iii.-x.); sulphate of zinc (gr. i.-vi.); perchloride of iron (gr. i.-ii.); chloride of zinc (gr. ii.–x.), in an ounce of water. It is of importance to make the patient introduce the nozzle of the spray well into the mouth (and for this reason I do not recommend the steam apparatus, and also because it causes undue dilution of the remedy), and inspire deeply during the process. This treatment should be repeated several times a day, and continued with necessary intermissions for some minutes at a time.

The insufflation of powdered alum is another and more powerful means of applying an astringent to the larynx. This method is most successful when practised by the physician, with the aid of illumination, but even then it is generally admitted to be inferior in efficacy to direct applications by means of the brush. A fairly intelligent person may, however, be taught to carry out this treatment himself.

As has already been hinted the direct application of liquid remedies to the interior of the larynx by means of a brush is the best mode of attacking obstinate cases. The solutions most recommended for this purpose are — nitrate of silver (gr. 10–50, ad ℥ i., and even much stronger); glycerine of tannin, chloride of zinc (gr. xxx., ad ℥i.); and iodised glycerine (iod. gr. vi., potas. iodid. gr. xii., ol. menth. pip. min. v., glycerine, ad. ℥i.).

If nitrate of silver be used, a weak solution should be employed first, and gradually strengthened, according to the susceptibility of the patient. Iodine is commonly advised in cases where there is much thickening, but I find it equally efficient in simple laryngitis. In cases where elliptical paresis of the cords is evidently a considerable factor in the loss of voice, the use of electricity is to be recommended. In all cases of chronic laryngitis it is of importance to examine the nose, and if there be distinct obstruction to treat this before considering the case hopeless. Although not inclined to attach so much importance as some authors to nasal disease as a factor in the production of laryngitis, I cannot but think that persistent mouth breathing must tend to irritation of the whole respiratory tract. It goes without saying that any coincident pharyngitis should also receive attention.

In *laryngorrhea*, Morell Mackenzie advises the local application of turpentine with a brush. Pine oil inhalations, and those containing oil of cubebs, may also prove useful.

In *laryngitis sicca*, Gottstein recommends the use of chlorate of potassium (20 gr. ad ℥i.), followed by nitrate of silver. I generally employ creasote inhalations (creasote, 80 minims, light magnesia, gr. 40, aq. ad. ℥i., Sig. ʒi. to a pint of water at 140° for each inhalation, as recommended in the London Throat Hospital Pharmacopœia), a spray of chlorate of potassium (gr. v.-x., ad ℥i.), followed, if necessary, by painting with iodised glycerine (as described above). Carbolic acid in glycerine (gr. 30, ad ℥i.) may also be used in this form of laryngitis. More recently I have been treating these cases with fluid vaseline, to which a small quantity of carbolic acid is added, applied by means of the De Vilbiss spray.

Where there is co-existing *fœtor* the same line of treatment should be carried out, while powdered boracic acid, iodoform, or iodol may also be insufflated. Of the fœtid form, however, I have had no personal experience.

Stoerk's *blenorrhea*, according to his description, seems to be peculiarly resistent to treatment, and combating its various developments as they arise seems the proper course to pursue.

In *granular laryngitis* iodine may be employed, while Morell Mackenzie speaks highly of nitrate of silver and sulphur waters.

In *trachoma* of the vocal cords the same authority advises perchloride of iron (ʒ ii. ad ℥ i.), and nitrate of silver (ʒ i. ad ℥ i.) while Schrötter, in obstinate cases, squeezes the nodules with forceps, and afterwards applies solid nitrate of silver.

CHRONIC HYPERTROPHIC LARYNGITIS.

As we have just seen, chronic catarrh may lead to localised hyperplasiæ in various parts. Thus, in gouty subjects and in those addicted to strong drinks, we sometimes see the epiglottis more or less thickened. Occasionally there is hypertrophy of one or both ventricular bands, and even of the vocal cords, while it is quite probable that in these cases there is an increase of connective tissue; yet this is not the chief feature of the disease, and, except in laryngitis sicca, there is never dyspnœa.

In the form of inflammation we are about to consider, connective tissue hyperplasia is the most prominent characteristic, and in many instances embarrassed breathing is the most marked symptom. The part of the larynx most liable to be affected is immediately beneath the vocal cords, and this form is spoken of as *subglottic chronic laryngitis* or *laryngitis hypoglottica chronica hypertrophica*. I believe that this disease is not common in Britain, and I am sure that it is rare in Scotland. As to its etiology, recent observations point to its identity in certain instances with rhinoscleroma—a bacillary disease. It is also stated by Gottstein to result from typhoid fever, struma, tuberculosis, and syphilis.

Schrötter[1] considers that cases which are described as prolapse of the ventricle of Morgagni, should really come under this heading. In these cases the hypertrophied mucosa projects and sometimes forms quite a tumour, which, when seen, seems to spring from the ventricle.

The *laryngoscopic appearances*, of course, vary according to the parts affected. In subglottic laryngitis a prominence is observed below the vocal cords; this appearance is usually bilateral and more or less symmetrical. The projections are best seen on full inspiration, and may be invisible during phonation, if this function be still preserved. The colour of the swellings may be either grey or pink, while, when touched with a probe, they have a hard resistent feel. In some cases there is also present viscid exudation, which tends to form crusts—an additional impediment to respiration being thus produced.

The *symptoms* of subglottic laryngitis vary somewhat. While the voice may be early affected in some instances, in others it is fairly well preserved. The most conspicuous, and, at the same time, the most important symptom is difficulty in breathing, the dyspnœa increasing as the respiratory canal diminishes in calibre.

According to Schrötter, spontaneous resolution may take place, and the same authority has noticed diminution of the thickened parts by gradual cicatricial shrinking. Ulceration he considers rare; and when it does occur, as being commonly due to mechanical causes. In other cases the disease advances slowly, but surely, until suffocation is threatened.

The *treatment* of chronic hypertrophic laryngitis must, of course, be adapted to the form of the affection which is present. Thus, if there be a specific history, iodide of potassium is indicated, and even in non-syphilitic cases it may prove useful. The application of iodine externally and internally may also be employed; while tumour-like growths, situated in the region of the ventricle, should be treated in accordance with the recommendations given in the chapter on neoplasms.

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[1] According to other authorities prolapse of the ventricle occurs suddenly after coughing, and is most frequently observed in phthisical subjects. I have had no personal experience of this rare condition.

In the subglottic form there can be no doubt that gradual dilatation of the stricture by means of Schrötter's bougies has so far yielded the best results. Dilatation may be practised without preceding tracheotomy by means of hard rubber laryngeal catheters, or after the trachea has been opened, in which case tin bougies are employed (*see* Therapeutics). Intubation with O'Dwyer's tubes has not, so far as I am aware, been practised in chronic subglottic laryngitis.

CHRONIC ŒDEMA OF THE LARYNX.

Chronic œdema is invariably associated with, and secondary to, grave structural changes in the larynx. Thus it may occur in the neighbourhood of syphilitic, tubercular, or malignant ulcers.

The prognosis and treatment must, of course, depend upon the primary disease.

CHAPTER V.

CHRONIC INFECTIVE DISEASES.

LARYNGEAL PHTHISIS.

LARYNGEAL phthisis may undoubtedly be a primary disease, but accurately recorded cases in which this has been demonstrated *post mortem*, are few. As a rule the larynx is affected as a secondary complication of pulmonary phthisis.

The symptoms of phthisis laryngea vary according to the stage of the disease, and also according to the extent to which the larynx is involved, and will be better discussed after, or together, with the laryngoscopic appearances.

Phthisis may manifest itself in the larynx as a tubercular infiltration, followed by ulceration (true phthisis laryngea), or by changes which, while not due to local tuberculosis, are commonly associated with the presence of pulmonary phthisis.

Of the latter, the most common is anæmia. There can be no doubt that the existence of marked laryngeal anæmia, more especially if associated with fugitive blushing of the bloodless parts, should lead to a careful examination of the lungs. Abnormal sensations referred to the larynx, with or without paresis of the adductors, are often due to neurasthenia, but may be the forerunners of pulmonary disease. Sometimes laryngeal phthisis first manifests itself by the occurrence of catarrh, which, in spite of every care, obstinately resists treatment. According to Schrötter, cases of catarrh in which only one side of the larynx is affected, are particularly suspicious.

In all these conditions no special line of treatment, beyond what has or will be discussed in other pages of this work is required, and they are only emphasised here in order to enjoin attention to the chest organs in cases where they occur.

Actual tuberculosis of the larynx may manifest itself in quite a variety of appearances, and usually attacks persons between the ages of twenty and forty, although the disease is by no means rarely seen before or after these periods of life.

One of the most common laryngoscopic appearances is infiltration of the ary-epiglottic folds. Both arytenoids and the adjacent parts appear as pale greyish pink swellings, having approximately the shape of an Indian club or pear, the narrow extremity pointing forwards. On the surface of the mucosa small cheesy-looking patches are often seen. When this condition is marked the patient usually complains of huskiness, and pain on deglutition, shooting up towards the ears. When ulcers form, as a result of this infiltration, they are usually small, but often numerous, eventually tending to coalesce.

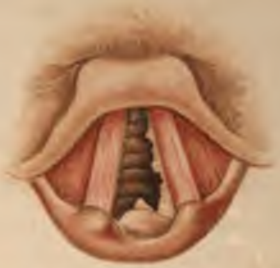

FIG. 4.—Phthisis laryngea, showing congestion and tumour in inter-arytenoid fold.

Infiltration of the inter-arytenoid fold is also a common manifestation of laryngeal phthisis. In some cases this appears as a sessile but distinct tumour, so situated that it prevents approximation of the vocal cords. Its surface is often irregular in outline, and probably in many cases it conceals an ulcer—being then in fact an exuberant granulation springing from its upper margin. Ulcers, when existing in this situation, and when not hidden by such granulations, are seen to be deep, and, like most laryngeal ulcers, covered with a layer of white secretion. While I consider the presence of such tumours as I have described to be almost pathognomonic of a phthisical taint, yet an ulcer in this situation may be due to syphilis. Even in a patient in whom neither discoverable signs nor symptoms of phthisis exist at the time of examination, the presence of a distinct neoplasm in the inter-arytenoid commissure is strong presumptive evidence of tuberculosis, and in such cases I have hitherto found that, after a varying interval, definite indications manifest themselves, my experience in this respect being confirmatory of the views expressed by Stoerk; on the other hand, if only an ulcer be present in a patient who has had syphilis, the diagnosis must depend upon weighing probabilities, the presence or

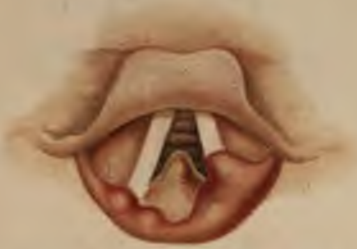

FIG. 5.—Phthisis laryngea, showing thickening of left ary-epiglottic fold and inter-arytenoid tumour.

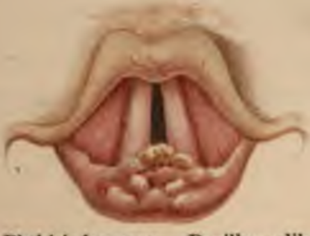

FIG. 6.—Phthisis laryngea. Papilloma-like tumour of inter-arytenoid fold.

absence of tubercle bacilli, and the effects of constitutional treatment.

In the case of inter-arytenoid infiltration, the most marked symptom is aphonia, from inability to approximate the cords. Ulcers in this situation often give rise to most troublesome cough.

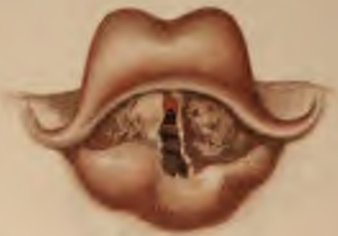

Fig. 7.—Phthisis laryngea. Infiltration of the epiglottis and ary-epiglottic folds; destructive ulceration of the interior of larynx.

Infiltration of the epiglottis is common, and if, as is often the case, rigidity be added to marked thickening, it may be either difficult or impossible to inspect its lower surface. When this is visible, it is frequently seen to be covered with small white ulcers. Sometimes, however, the ulceration is more pronounced, and occasionally the part is almost totally destroyed. Discomfort and pain on deglutition are the most marked symptoms produced by tubercular disease of the epiglottis.

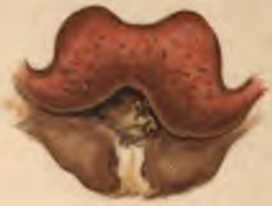

Fig. 8.—Phthisis laryngea. Infiltration of the epiglottis and ary-epiglottic folds; minute ulcers on epiglottis; large ulcer of inter-arytenoid region; destruction of interior of larynx.

The ventricular bands may be the seat of infiltration or ulceration. The former is marked by thickening, while the ulcers are commonly at first small, white, and shallow.

In the vocal cords infiltration manifests itself by thickening, which is usually irregular, and thus produces a nodular appearance. The colour of the infiltrated parts is often of a pale pink, as pointed out by Stoerk. When ulceration occurs, the following peculiar appearance may result. Owing to loss of substance and the presence of much elastic tissue, the vocal cord may seem to be cleft longitudinally; indeed, in the laryngeal mirror it often looks as if there were two cords, one just above the other. Another form of tubercular ulcer of the cord is that which begins near the vocal process and tends to produce an eaten-out appearance of the affected part. In tuberculosis of this region, the most marked and often the only symptom directly traceable to the local lesion, is huskiness or loss of voice.

Having so far discussed the changes which may occur in each part of the larynx, and the laryngoscopic appearances which they give rise to, it only remains to say that all or most of them may be combined in the same patient. Thus, in an advanced case, the laryngoscope often reveals only a thickened or ulcerated epiglottis, and greyish pink swollen ary-epiglottic folds, the whole interior of the larynx being hidden by purulent, often more or less offensive, secretion. If this be got rid of, so much destruction of the various parts may be present as to make their differentiation well nigh impossible. When laryngeal phthisis is associated with deep and far-reaching ulceration, the cartilage is liable to become involved, and the phenomena described under perichondritis, including stenosis of the larynx with resulting dyspnœa, may follow. If the infiltration of the ary-epiglottic folds, ventricular bands, and epiglottis be very marked, respiration may also become impeded to such an extent as to necessitate tracheotomy. The symptoms of laryngeal phthisis have already been more than touched upon, varying, as they do, with the part of the larynx affected. In most cases the characteristic phenomena of pulmonary tuberculosis are more or less pronounced, and the diagnosis is comparatively simple.

In some rare cases the only manifestation of phthisis laryngea is the presence of *tubercular tumours*, the first example of which was recorded by John Noland Mackenzie. As we have already seen, localised neoplasms may be met with usually on the inter-arytenoid fold; these are, however, often simply granulations, and in any case seem to consist only of epithelium and connective tissue; they are, therefore, not analogous to the form now under consideration. True tubercular tumours vary in size from a pea to a hazel nut, and may be either single or multiple. According to the descriptions of those who have observed this rare form of neoplasm, the growths seem to be usually of a pale colour and sessile. I should think that when such a tumour occurs as a primary manifestation of phthisis, its differentiation, without removal of a fragment for microscopical examination, would be well nigh impossible. On the other hand, the presence of well marked pulmonary phthisis would afford assistance in arriving at an opinion. When microscopically examined, these neoplasms are found to consist of fibrous tissue and tubercular nodules, including giant cells and bacilli.

The *diagnosis* of laryngeal phthisis is comparatively simple in typical cases; the pale and pyriform swelling of the ary-epiglottic folds, the presence of pulmonary disease, with or without the infiltrated epiglottis, are more or less characteristic. Again, when the inter-arytenoid fold is the seat of a sessile distinct neoplasm, it is almost certain that the patient is already the victim of tuberculosis, for this region seems to enjoy an immunity from other tumours.

When infiltration occurs in other parts of the larynx the chief difficulty that is likely to arise is differentiation from syphilis, and the colour of the parts is then of great importance. While tubercular deposits are usually of a pale greyish blue tint, gummata are commonly red and angry looking. Ulceration also occurs much more rapidly in syphilis than in tuberculosis, but when it has actually occurred, diagnosis is by no means always easy. According to Morell Mackenzie, syphilitic ulcers are often single, they certainly increase more rapidly than those due to phthisis, and tend to extend in depth. Further, syphilitic ulcers have their favourite location on the upper surface and margin of the epiglottis, and soon cause marked loss of tissue. Tubercular ulcers are often numerous, of small size, and Fränkel states that their margins are surrounded by yellow deposits of miliary tubercle; they are commonly found on the ary-epiglottic folds, the false cords, the lower surface of the epiglottis, and between the arytenoids. Syphilis, when it attacks the vocal cords, causes much more rapid destruction than tuberculosis. In advanced cases, the diagnosis, as far as laryngoscopic appearances go, might be difficult; but the history, general symptoms, and pulmonary signs will then make differentiation simple. In any case of suspected phthisis, the sputum must, of course, be examined for tubercle bacilli; and if a laryngeal ulcer of doubtful character be present, some of the secretion may be removed for the same purpose by introducing a laryngeal brush, or cotton wool attached to a suitable holder.

Other diseases which may produce infiltration, followed by ulceration, are lupus, leprosy, and typhoid fever. In the last two the history of the case will, in most cases, suffice, and lupus —owing to the presence of characteristic nodules—should not be mistaken for phthisis.

As a method of diagnosis in doubtful cases, injections of tuberculin, according to Koch's method, have been advocated. Whether the employment of this potent organic poison is justifiable for diagnostic purposes alone, each practitioner must judge for himself.

The *prognosis* of phthisis laryngea is always extremely grave, but it is now well known that tubercular ulcers of the larynx may heal. The progress of the throat affection is often directly proportionate to that of the pulmonary disease. I have known a case of laryngeal phthisis—so advanced that on first seeing the patient I thought tracheotomy would soon become necessary—remain perfectly quiescent for years, without apparent injury to the patient's general condition. On the other hand, when extensive ulceration, associated with much secretion, is present, an early fatal issue may be expected. When ulceration is marked there is always a danger of perichondritis and œdema hastening the end. That very extensive ulcers may heal is demonstrated by a case recorded by J. Solis Cohen, who observed a laryngeal stenosis, due to the formation of a thick membrane, as a result of tubercular disease. Even when phthisical ulcers have healed there is always a danger of relapse, which must be borne in mind. When marked dysphagia is present the prognosis is most unfavourably affected, as the often constant pain and inability to swallow without suffering add to the wasting of the cachexia.

The *treatment* of laryngeal phthisis of necessity includes the general treatment of tuberculosis. In a special treatise, however, it is not necessary to discuss what is described in every work on Practice of Medicine. I shall therefore content myself with referring only to such points as relate to the local disease, assuming that attention must at the same time be directed towards diet and general remedies.

As is well known, climatic treatment is of great importance in pulmonary phthisis, and as the laryngeal condition is likely to vary with that of the lungs, it follows that it is of equal consequence in the affection we are discussing. Hitherto it has always been assumed that high altitudes are not well tolerated in laryngeal consumption; Clinton Wagner, however, after carefully investigating the matter, concludes that such resorts as Davos are admissible, provided only the pulmonary lesion be improving. San Remo, Mentone, Pisa, and Venice, are recommended by Gottstein, while the insular climates of Madeira and the Canary Islands are also valuable. What is required in laryngeal phthisis is a climate which allows the patient to spend most of the day in the open air, where the atmosphere is free from dust, and contains a certain amount of moisture.

In tuberculosis of the larynx the patient must be directed to save his voice, and he must also avoid irritants, whether atmospheric or dietetic. A certain amount of stimulant is often required, but the irritating action of the alcohol must be diminished by dilution. When deglutition is painful, the diet must be especially bland; and fluids thickened with arrowroot or an equivalent are more easily swallowed than liquids or solids. Lennox Browne particularly recommends the yolk of a raw egg swallowed whole as furnishing much nutrition at the cost of small exertion. Wolfenden has found that when dysphagia is due to ulceration of the epiglottis, swallowing is less painful if the patient suck from a tumbler through an india-rubber tube while lying prone on a couch with the legs rather elevated. In some cases it is necessary to apply a local anæsthetic before a meal. A spray of cocain (10 per cent.) is very effective, but a local tolerance of this drug seems to become established after continuous use, so that its anæsthetic effect becomes less marked; besides, its frequent employment may act injuriously in other ways. A spray of menthol, or better, menthol pastilles (¼ gr. in each), are less objectionable methods of attaining temporary anæsthesia; but unfortunately they produce marked diminution of the sense of taste, and are for this reason objected to by some patients. Swallowing pieces of ice and the insufflation of boracic acid in fine powder, to which has been added from ⅛ to ¼ gr. of acetate of morphia, may also be employed to relieve pain.

The *local medication* of laryngeal phthisis has of late years made rapid strides. A few years ago Krause introduced the lactic acid treatment, which consists in the application of a solution varying from 20 - 80 per cent. (according to the toleration of the patient) to the interior of the larynx by means of a cotton wool pledget or brush. The remedy should be applied with a certain amount of force, which, like the strength of the solution, must be regulated by the toleration of the subject. The frequency of application—whether daily or with an interval of some days—must be estimated on the same lines. There can be no doubt of the beneficial effects of this form of treatment, but in many cases it causes pain. This may, to a certain extent, be obviated by employing cocain immediately before the application, or the lactic acid and menthol treatment may be combined. One of the chief advantages claimed for lactic acid is that it acts especially on the ulcerated surface, and further, it also tends to remove tubercular infiltrations. Although very painful at the time of application to some patients, it may relieve the dysphagia in the same cases.

Another form of treatment which has been attended with excellent results is the injection of a solution of menthol in olive oil (20 p.c.) into the larynx by means of a syringe, as suggested by Rosenberg. In employing this method only about fifteen minims should be used at the first sitting, but the quantity may soon be increased, and unquestionably most persons tolerate these injections well. After the syringe has been emptied, the patient is directed to take deep inspirations, and most persons afterwards feel a sensation of warmth referred to the thorax and between the shoulders. Menthol used in this way acts as (1) an anæsthetic; (2) an antiseptic; (3) a stimulant. It relieves cough and diminishes expectoration in many cases. It acts beneficially alike in laryngeal ulceration, and upon the pulmonary lesion, probably by virtue of its volatile and antiseptic properties. If the patient be so situated that he cannot have the injections made regularly, an excellent substitute may be found in the employment of the oleaginous solution by means of the De Vilbiss spray. In most cases I order at the same time menthol pastilles, and often also inhalation of menthol by means of Yeo's respirator—some of the menthol solution being dropped on the sponge, and the inhaler worn as long as practicable. Menthol is a good remedy, and I have seen tubercular ulcers heal under its employment; but in my opinion its value has been over estimated.

Insufflations of finely powdered boracic acid and iodoform in equal parts have also yielded favourable results, and more recently Lublinski has achieved cicatrisation of undoubtedly tubercular ulcers by means of powdered iodol—a drug which seems to have all the useful, and none of the disagreeable properties of iodoform. The methods just discussed probably have, so far, attained the best results to be achieved without operative interference.

Steam inhalations must be at best palliative, whether creasote, carbolic acid, or balsam of Peru be added to the water, nor does the substitution of camomile infusion for water strike me as likely to have any great therapeutic result. On the other hand, the local application of carbolic glycerine may, owing to its combination of antiseptic and analgesic properties, be useful in certain cases. Schnitzler has recently suggested the application of balsam of Peru followed by collodion, a plan of treatment for which he claims success.

Active surgical methods have of late been advocated. M. Schmidt advises incision of the infiltrated tissues—especially the epiglottis and ary-epiglottic folds. Scarification may certainly give relief when there is coincident inflammation, but the general utility of this form of treatment is open to question. The same author is also an advocate of tracheotomy under the following conditions:—

(1.) Always in stenosis, and it is advisable not to delay too long.

(2.) In severe laryngeal disease with slight pulmonary affection.

(3.) When the lungs are comparatively healthy, and the laryngeal disease is rapidly progressing. He also considers that when painful deglutition is present an additional indication is afforded.

Heryng has recorded successful results from a form of treatment which must at present be considered somewhat heroic, but which has undoubtedly yielded more or less satisfactory issues. If a case proves obstinate under the ordinary lactic acid treatment, and if the general condition admits of it, he incises the infiltrated parts and then repeats the application. In the case of ulcers or vegetations he uses curettes, and thus scoops away the diseased tissues; afterwards he does not hesitate to repeat the application of lactic acid. In the case of tubercular infiltration it has also been recommended to inject solutions of lactic acid into the tissues by means of a specially constructed laryngeal syringe. Although I have not, so far, employed Heryng's method, there can be no doubt that it is scientific in principle, and has had a number of successes. Electrolysis, too, has been advocated in tubercular infiltrations—and even in ulceration. In all such heroic methods, however, the physician must consider whether the bright side of the picture compensates for, or more than compensates for, possibility of a darker side.

As to the treatment of tubercular tumours, if recognised as such, it is questionable whether operative interference is desirable except to relieve dyspnœa, or to fulfil some other urgent indication. In a case recently recorded by Dehio, such a neoplasm was removed by laryngotomy from a patient whose lungs were healthy, and the operation was rapidly followed by acute miliary tuberculosis, ending in death.

Of late, two novel methods of treating tuberculosis have come under notice, suggested respectively by Koch and Liebreich. Koch's method consists, as is well known, in the hypodermic injection of minute doses of tuberculin—a substance prepared from tubercle bacilli. In most phthisical patients these injections produce within a few hours fever and œdema of the tubercular areas, often followed by breaking down, and sometimes by resorption. It is quite impossible in the present state of our experience to criticise effectively the value of Koch's lymph as a means of treating laryngeal tuberculosis. Its employment seems sometimes to be followed by breaking down of the infiltrated parts, sometimes by cleaning of the surface of phthisical ulcers, occasionally by the development of ulcers in areas of the larynx and pharynx hitherto apparently healthy, and rarely by cure. Although a certain amount of œdema of the larynx occurs, still, so far as recorded cases go, it is astonishing how rarely it has been necessary to employ tracheotomy to obviate the effects of the swelling of the parts resulting from injections of tuberculin. Liebreich's method is the hypodermic injection of small quantities (1-4 deci-milligrammes) of cantharidinate of potash—a proceeding which, so far as recorded results have gone, does not seem to be associated with the dangers appertaining to Koch's method. In laryngeal phthisis, Heymann and B. Fränkel have recorded satisfactory results from its employment.

Of tuberculin and cantharidinate of potash it must, however, be stated that as yet both methods are too novel to admit of any definite statements as to their value. It must also be borne in remembrance that tuberculin is by no means a harmless remedy, as has been shown by Virchow.

SYPHILIS.

In the earlier stages of syphilis, *laryngeal catarrh* is a common symptom. This catarrh does not in many cases differ from a non-specific affection except in the obstinacy with which it resists local treatment, and the readiness with which it commonly yields to anti-syphilitic remedies. The diagnosis must then depend upon the history of the case and the presence of other evidences of secondary syphilis, *e.g.*, mucous patches in the mouth and pharynx, skin eruptions, alopecia, enlarged glands, and condylomata, at the lines of junction between skin and mucous membrane, such as the anus, lips, and vagina. In some cases, however, the appearance of a larynx in secondary syphilis may be, while not pathognomonic, at all events sufficiently peculiar to suggest to the mind of the observer a suspicion as to the true nature of the case. In these the vocal cords have a mottled appearance, owing to the presence of alternate patches of red and white. This is the view held by Jullien and Lennox Browne among others, and with it I am inclined to agree.

Mucous patches or *condylomata* also occur in the larynx. I cannot myself remember ever to have seen a condition analogous to the grey opalescent patches so commonly met with in the mouth and pharynx, but most writers agree that mucous plaques are found in the larynx. According to Whistler, opalescent patches in the larynx, resembling those seen in the mouth and pharynx, are most commonly observed on the upper surface and free margin of the epiglottis; they are also met with on the arytenoids, ary-epiglottic folds, and inter-arytenoid commissure. In colour these condylomata are greyish white; and in size they vary from a pin head to a shot. According to the same author they sometimes become inflamed, and then appear as red elevations, with an ulcerated surface. According to Whistler the presence of mucous patches on an inflamed vocal cord gives rise to a mottled appearance, which I take it is analogous to the form of laryngeal catarrh already referred to as occurring in secondary syphilis. I may add, however, that the cases of this kind I have met with could not be referred to the definite presence of mucous patches.

Superficial ulceration of the larynx may occur during the first year after infection.

In tertiary syphilis, the most common laryngeal lesion is *ulceration*. These ulcers are, however, preceded by syphilitic infiltration, which is commonly diffuse, but may be localised.

As a matter of clinical experience it is rarely that a patient comes under observation during the *period of infiltration*, and before breaking down has occurred.

These *syphilitic deposits* show themselves most commonly on the epiglottis, but may appear in other parts, *e.g.*, the ary-epiglottic folds, ventricular bands, and true cords. In colour they are commonly of a darker red than the normal mucosa, and usually commencing ulceration shows itself as a yellow spot of varying size. When the deposits are more localised they may appear as single tumours, or as numerous nodules of varying size. Very rarely a syphilitic gumma appears in the trachea, and can then be diagnosed by means of the laryngoscope, as a tumour occupying more or less of the lumen of the windpipe.

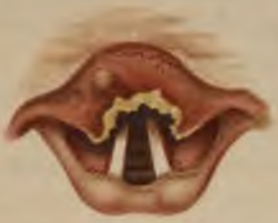

FIG. 9.—Syphilitic ulceration of the epiglottis.

These infiltrations and tumours tend to break down rapidly, and give rise to deep and destructive ulceration. Syphilitic ulcers are usually deep, with raised margins and a dirty white floor. According to Morell Mackenzie they are commonly single, and it is rare to meet with more than two. Their size is considerable, and they tend to involve the cartilage if allowed to go on without treatment. The surrounding mucosa is usually red and angry, while a more or less

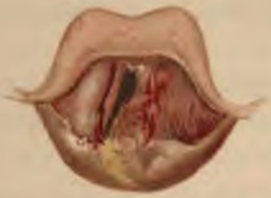

FIG. 10.—Syphilis. Infiltration of left side of larynx with commencing ulceration.

extended area of inflammatory œdema is usually met with in their vicinity. The rapidity with which the destructive process progresses is astounding, and after healing cicatricial distortion of the larynx, with obstructed respiration, often remains; in some cases, too, a web may be formed joining the vocal cords. Occasionally the arytenoid cartilages are so fixed by adhesions that stenosis results in this way.

In *hereditary syphilis* changes may be met with similar to those which occur in the acquired form.

The *symptoms of syphilis* of the larynx vary according to the stage and extent of the disease. In the earlier forms (catarrh and mucous patches) only slight huskiness may be complained of. In tertiary syphilis there is more or less vocal disability, sometimes amounting to aphonia. Gummatous deposits may be so situated as to cause dyspnœa, while the same symptom may eventually result from cicatrisation of extensive ulcers, perichondritis, or œdema. If the epiglottis be involved more or less difficulty in swallowing is experienced, but very marked pain is not usually a feature of the disease.

The *prognosis* is usually favourable, but if extensive destruction of tissue has taken place a tracheotomy tube may have to be permanently worn, owing to subsequent stenosis. Œdema and perichondritis are complications which, in neglected cases, may terminate fatally. Permanent injury to the voice is, of course, quite common as a result of tertiary syphilis.

In the early stages the presence of marked secondary syphilis will usually prevent mistakes in *diagnosis.* It must, however, be remembered that a syphilitic patient may suffer from a simple catarrh, and that the specific form is in many cases by no means pathognomonic.

It is in the tertiary variety that difficulty is liable to be experienced.

Syphilitic infiltrations are characterised by their red colour and tendency to break down rapidly, while tubercular deposits appear as pale swellings, which ulcerate slowly. Gummata, when they occur, might be mistaken for tumours, but they pass more gradually into the surrounding inflamed tissues.

While there is nothing pathognomonic about syphilitic ulcers, yet the history of the case, the presence of other manifestations throughout the body, examination of the lungs, the absence of tubercle bacilli, and the redness of the surrounding tissues, usually serve to distinguish them from the tubercular variety. In syphilis, too, the ulcer is often single and of large size, and the lingual surface of the epiglottis is a favourite location, the ulceration is usually more defined, there is less secretion, and that which covers the floor is more adherent.

In cases in which an ulcer occurs in the inter-arytenoid fold in a person who has had syphilis, and in whom no definite pulmonary disease can be detected, the diagnosis is extremely difficult, and can sometimes only be arrived at by carefully considering every point, and eventually trying the effects of constitutional remedies, or tuberculin.

It is commonly held that in tertiary ulceration of the larynx, a similar condition, present or past (as indicated by cicatrices), can generally be detected in the pharynx. According to my experience, however, laryngeal ulceration is often present without any corresponding condition of the upper parts of the throat.

I do not think that lupus should be mistaken for syphilis. In those cases which I have observed, the nodular infiltration, the absence of secretion, and of evidences indicating rapid ulceration, were typical.

Leprosy of the larynx only occurs as part of the general disease.

It must be remembered that marked distortion of the larynx may result from typhoid ulceration, injury, and rarely from healing of tuberculosis; sometimes, too, a web connecting the vocal cords may exist as a congenital abnormality, while a similar deformity may result from Stoerk's blenorrhea.

The difficulty which is most likely to encounter the more experienced laryngologist is in differentiating carcinoma from syphilis, and this will be best discussed under the former heading in the chapter on Neoplasms.

The *treatment* of laryngeal syphilis must be in the main constitutional. In the early stages, mercurial inunction—or, if it be preferred, the administration of mercury by the mouth—is indicated. In the tertiary form our main dependence must be upon iodide of potassium in large doses (10-20 grs. thrice daily to begin with, increased if necessary). It may, however, be useful—particularly in cases which have never received treatment, and when a rapid result is of importance—to combine mercurial inunction with the iodide. When the patient is seen before extensive ulceration has occurred, rapid constitutional treatment is of the highest importance.

In a case of gumma of the trachea, which I saw in consultation with Dr. Lucas, the tumour had not begun to ulcerate but showed a yellow patch on its surface, indicating imminent breaking down. This was, however, prevented by more than usually active constitutional treatment, so that the tumour disappeared without cicatrisation, and no permanent narrowing occurred. I mention this instance as an example of the value of pushing general treatment in cases of tertiary syphilis of the upper air passages—more especially if the case be seen before ulceration has begun.

In syphilitic catarrh—if the affection should prove obstinate—the same local remedies which have been discussed under Chronic Catarrh, may be used. I have generally found that ulcers heal under constitutional treatment alone. A spray of corrosive sublimate (1-2000), or the local application of solid nitrate of silver may be employed in obstinate cases.

Syphilitic œdema and perichondritis must be treated locally as well as generally, as already stated; in either case tracheotomy may be required.

If during the process of healing stenosis of the larynx threatens to arise, this must be prevented by using Schrötter's bougies or O'Dwyer's tubes, as recently advocated by Lefferts.

If a membrane has already formed, attempts should be made to remove it with a laryngeal knife, the electric cautery, cutting forceps, or a combination of these methods, and afterwards dilatation must be practised. In complete stenosis, Newman's method of dilatation by tupelo tents has yielded excellent results in the hands of this authority.

LUPUS.

As is now generally recognised, the *pathology* of this disease is closely allied to, if not identical with, tuberculosis. In both diseases there is a granular (small-celled) infiltration; in both giant cells are found, and in both tubercle bacilli exist. In this last respect, however, there seems to be a difference as to quantity; for while in sections of true phthisical infiltrations bacilli are commonly numerous, in lupus they are present only in small quantities. Considering this apparent identity in histological characters, it is astonishing to find the difference which exists between laryngeal lupus and tuberculosis, both in naked eye characters and clinical course.

Lupus of the larynx is not common, but in view of the slow, painless course of the disease, and from the observations of Holm and Chiari (in conjunction with Riehl) it is probable that if all those who are affected with lupus of the skin were examined with the laryngoscope, the disease would be discovered in a percentage variously estimated at from 3 to 8.

As in lupus elsewhere, the persons most commonly affected are young women under twenty. I have, however, seen the disease in boys (associated with lupus of the pharynx) and also in an adult man (a patient shown me by Dr. Semon). As a rule there are evidences of the same disease on the skin, but Von Ziemssen has recorded a case in which lupus occurred primarily in the larynx, and I have met with a similar instance, in which the disease first attacked the larynx and eventually extended to the pharynx (the patient from whom the accompanying drawing was taken).

The *symptoms* are, as a rule, slight. Pain is, in my experience, conspicuous by its absence, while more or less interference with the vocal function is common.

When ulceration has been followed by cicatrisation, stenosis of the larynx and dyspnœa may result.

Laryngoscopic examination alone may often lead to a diagnosis. The epiglottis is the part most commonly affected, though the characteristic infiltration may appear on the ary-epiglottic folds, ventricular bands, inter-arytenoid space, and true cords. The parts attached are thickened, and on the surface are seen a number of small rounded prominences, varying in size from a pin head to a No. 4 shot, or even larger.

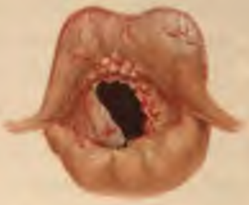

FIG. 11.—Lupus of the larynx.

Ulceration is very slow, and, so far as I have seen, is never associated with any large quantity of secretion. Indeed, the lupoid ulcer of the larynx is the only form I am acquainted with in which there is no layer of pus covering the floor. At a late stage of the disease some authors have observed secondary necrosis of the cartilages, but this is probably a rare occurrence. As before stated, gradual stenosis of the glottis may result after cicatrisation has occurred. Lupoid cicatrices may sometimes be recognised by the presence of the characteristic nodules on the white scar.

The course of the disease is slow. In April 1883 I saw a patient, æt. 23, with lupus of the larynx. Three years before she had lost her voice, and five years previously she had lupus of the nose, which, at the time of examination, bore the old scars. My colleague, Dr. Jamieson, very kindly saw the case, and agreed in the diagnosis of lupus, so far as the external cicatrix was concerned. The laryngoscope showed lupus infiltration of the epiglottis, left vocal cord, and inter-arytenoid space. Quite recently (November 1889) I heard that the patient was still alive and enjoying fair health.

I do not think there is any difficulty in *differentiating* lupus from tuberculosis. The nodular infiltration, its red and somewhat congested appearance, the absence of the characteristic appearances of phthisis laryngea and the common association of other manifestations of past or present lupus make a mistake unlikely. Syphilis presents some points of resemblance, but, on the other hand, many of distinction. Syphilitic ulceration is rapid and more pronounced than lupoid; the nodular infiltration is absent, and although gummata are occasionally multiple and of small size, yet they are invariably larger than the papillary excrescences of lupus. Besides, tertiary syphilis is not very frequently met with in young girls and boys, who are the commonest victims of lupus.

The *treatment* of this affection can hardly be considered satisfactory, although Semon had a successful issue after repeated applications of the electric cautery. Lactic acid may be used as in phthisis laryngea; indeed, it was its value in external lupus, as shown by Mosetig, which led to its employment in tuberculosis. Other caustics, such as nitrate of silver, may be applied, while the internal administration of cod liver oil and tonics are indicated.

In lupus of the larynx Koch's method may be tried, as it is in this disease that most successes have been recorded. The patient whose larynx is depicted above, is at present undergoing injections of tuberculin after preliminary tracheotomy—a proceeding suggested and carried out by my colleague, Prof.

Chiene. It seems to me that opening the windpipe should certainly form the first step in the treatment, as otherwise the broken down lupus tissue would tend to be drawn into the pulmonary ramifications.

LEPROSY.

Leprosy only attacks the larynx after the general disease has become firmly established and its signs unmistakable. Since the middle ages, when the vox rauca was considered in many cases sufficient to condemn its unfortunate possessor to the leper's unhappy exile, this complication of leprosy has been more or less recognised. The *symptoms* consist of hoarseness, varying in amount, and after a time dyspnœa, due to respiratory obstruction.

Laryngoscopic examination shows that various parts of the larynx are infiltrated, and therefore thickened. The infiltrations may present a smooth or nodular surface, and eventually slow ulceration sets in.

In the only case of laryngeal leprosy I have met with there was a smooth, tense thickening of the epiglottis and cords—the colour being paler than in inflammation, and more pink than in non-inflammatory œdema.

The *treatment* of laryngeal leprosy must be symptomatic and associated with general remedies, which are, however, usually powerless to control this slow but deadly malady.

CHAPTER VI.

NEOPLASMS OF THE LARYNX.

In discussing laryngeal growths I shall not refer in detail to tubercular tumours, which have been already discussed in the section on laryngeal phthisis. Nor need I do more than again mention the fact that exuberant granulations may spring up around tubercular or syphilitic ulcers, which, however, are not to be reckoned as tumours. Neoplasms of the larynx, like those met with elsewhere, may be either—(1) Innocent; or (2) Malignant.

Innocent Neoplasms.

I do not think we have yet any data which throw light upon the *etiology* of non-malignant tumours of the larynx. Constant congestion—such as is likely to exist in habitual voice users—is spoken of by some authorities as an important etiological factor. It must, however, be remembered that those who live by their voices are most likely to detect any slight alteration—such, for example, as may be produced by a small tumour situated so that it does not lie between the cords on phonation. Lennox Browne considers that syphilis is a common cause, but this opinion is not generally accepted. There can be no doubt that a small laryngeal growth—probably composed of granulation tissue—may form in the larynx of a healthy person, and disappear without active operative interference. I had an opportunity of seeing an example of this in a well known surgeon, where a small distinct neoplasm appeared on the vocal cord, and disappeared without any further treatment than rest of the voice and an astringent spray. The history of the case pointed to vocal strain, followed by effusion of blood, and resulting formation of granulation tissue.

The frequency of benign neoplasms seems to vary in different localities. So far as I have been able to observe during my eight years' tenure of office at the Royal Infirmary of Edinburgh, and in private practice, innocent growths are comparatively rare in Scotland, although Newman places them as high as from two to two and a half per cent. of chronic laryngeal disease.

The *symptoms* produced by laryngeal neoplasms naturally vary according to the situation and size of the growth or growths.

A small tumour situated on the ary-epiglottic fold, epiglottis, or even on the ventricular band, may cause no symptoms of any kind. On the other hand, a minute growth on the margin of a vocal cord will cause marked hoarseness or even aphonia. If such a neoplasm be pedunculated, the voice may undergo sudden changes, according as the tumour lies between the cords or not.

Dyspnœa is usually inspiratory, and occurs when single or multiple growths are of sufficient size to embarrass respiration. This is specially marked when the tumour is pedunculated and attached—as such growths commonly are—to the supra-glottic parts. In rare cases, when the attachment is subglottic, the dyspnœa is most marked on expiration.

Other symptoms, besides interference with voice and respiration, are usually absent. I have known a patient with a large growth on the epiglottis complain only of a peculiar "clucking" sound on deglutition.

It is useless to consider further the semeiology of laryngeal neoplasms, as their diagnosis can only be made by means of the laryngoscope.

The tumours most commonly met with are papillomata and fibromata.

Papillomata, or warts, occur most frequently in children or young people, but may also be seen in adults and elderly persons. Their appearance is in many cases characteristic. In colour they are usually of a pale pink, and the surface has a very distinct, uneven, cauliflower-like appearance, which, when once seen, is readily recognised. It must, however, be borne in mind that epithelioma may, in its early stages, simulate a simple papilloma; and in cases of single growths in middle aged, or elderly people, great care should be exercised before a positive opinion is given. To this subject, however, ample attention will be given in discussing carcinoma. There can, however, be no doubt that, as before stated, laryngeal papillomata, like warts elsewhere, occur more frequently in young people and children than in adults. It is very common to find them multiple, and situated on the vocal cords, ventricular bands, and ary-epiglottic

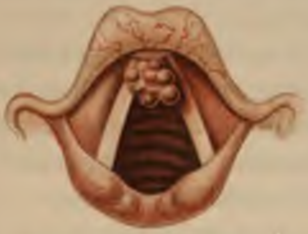

FIG. 12.[1]—Single papilloma.

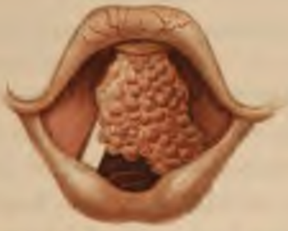

FIG. 13.[1]—Multiple papillomata.

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[1] For these two drawings I am indebted to Dr. Felix Semon, who successfully operated on both cases.

folds. When in large numbers the growths may obscure the vocal cords entirely; and in such cases, both loss of voice and embarrassed respiration are more or less marked. Papillomata, although innocent, are exceedingly prone to recur after removal.

Fibromata differ from the preceding form in appearance, and in the fact that they exist singly. These tumours are usually quite smooth, although when of large size there may be a tendency to lobule formation; while in colour they vary from a pale to a dark shade of pink, or even red.

Their most common origin is from one or other of the vocal cords, but they may grow from other parts. Fibromata are sometimes pedunculated, but more commonly their attachment is only slightly narrower than the body of the growth. In size these tumours vary within very wide limits; they may be no larger than a large pin head, while I have seen one which filled the whole interior of the larynx.

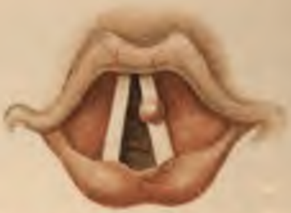

FIG. 14.—Small fibroma of left vocal cord.

Of other tumours, I have only seen the cystic, fatty, myxomatous, and cartilaginous forms.

Cysts are rare, and occur usually either on the epiglottis or spring from the region of the ventricle. In the only case I have seen—a woman of 74—the tumour was about as large as a small hazel nut, and grew from the anterior extremity of the left ventricle.

The most striking points in the appearance of the growth were—(1) its tense look; (2) comparatively distinct and distended vessels coursing over it; (3) a peculiar opaque translucency; (4) globular shape. In spite of these peculiarities, however, I failed to make the diagnosis until after operative interference. After applying cocain the growth was grasped with Mackenzie's forceps, upon which it collapsed, and only the cyst wall came away in the forceps.

I believe that hitherto most of these cases have only been diagnosed after attempts at removal or exploratory puncture; but I cannot help thinking that were such an example to occur again in my practice, a positive conclusion could be arrived at by attention to the characteristics just mentioned, and examination of the larynx by transmitted light.

Lipomata, or fatty tumours, are extremely uncommon. Only six examples have been met with, and of these two were not removed during life. Of the four operated upon, one was observed by Bruns, one by Schrötter, and two by myself.

These growths, so far as we are at liberty to generalise from data so limited, may be either sessile or pedunculated. Their surface is of a somewhat pale colour, slightly lobulated, or, as in Schrötter's case, consisting of finger-like processes. In my own cases one patient had a large tumour with a broad base springing from the upper surface of the epiglottis and adjacent part of the tongue, while the other had a pedunculated growth arising from the sinus pyriformis, but projecting into the larynx. These lipomata seem to give rise to comparatively slight symptoms, considering their size, and, further, unless their enucleation be complete, tend rapidly to recur, as in one of my cases.[1]

Myxomata have been described by Mackenzie, Bruns, Schmidt, Tauber, King, Eemann, and Dudefoy, and in all these cases the tumour seems to have been distinctly localised. The only case of myxoma which I have met with was diffuse, replacing and infiltrating the vocal cord of one side, and having, in fact, every feature of malignancy. Half the larynx was excised by Professor Annandale, and a careful microscopic examination showed that the tumour was of a distinctly infiltrating character, displacing and separating muscle fibrillæ. No conclusive evidence of sarcoma could be found, but examination of the cartilage showed a very slight round-celled infiltration.

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[1] These will be found fully described in the *Transactions of the Medico-Chirurgical Society of Edinburgh*, vol. VIII.

Cartilaginous tumours, or *ecchondroses*, are very rarely met with. When present they spring from either the cricoid or thyroid cartilages, and usually grow inwards. Such growths have been described, among others, by Mackenzie, Asch, and Böcker. The last named authority operated on two cases. In the first a small growth was apparent under the right vocal cord, and was removed by means of a laryngeal knife and specially constructed chisel-like instrument. In the second a neoplasm as large as a hazel nut sprang from the cricoid, and as it embarrassed respiration, the whole cartilage was removed. Ecchondroses can, of course, be distinguished by their hard consistence, as detected by the probe. In the only instance of this form of tumour I have met with, the growth was beneath the right vocal cord, apparently growing from the cricoid cartilage. It caused no marked symptoms, and diminished somewhat in size after being touched with the electric cautery; the patient is still under observation.

In very exceptional cases laryngeal tumours have been removed, which have, by microscopic examination, been proved to be composed of *thyroid gland tissue*.

Angiomata are occasionally met with, and are usually characterised by their dark colour and tendency to bleed after removal.

In *Hodgkin's disease*, or *lymphadenoma*, tumours have been described as occurring in the larynx by Eppinger and Semon.[1] The latter, in conjunction with Beale, made the diagnosis during life, which was substantiated by *post-mortem* examination.

We need not dilate further upon the diagnosis of laryngeal tumours, as the distinguishing characters of each have been already described.

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[1] Owing to the kindness of Dr. Semon, I was enabled to examine this case during life.

The *prognosis* in innocent neoplasms is invariably favourable as *regards life*. Even if endolaryngeal operation be not practised, tracheotomy will usually ward off death by asphyxia. Should thyrotomy be required in order to accomplish removal of a growth, the result, as regards the life of the patient, will usually be satisfactory if the operator be dexterous, and, at the same time, careful.

As regards *the voice*, the best results are obtained from endolaryngeal operations, and the prognosis in this respect will be most favourable in cases where the tumours are pedunculated and accessible.

In the case of papillomata the tendency to recurrence must be borne in mind when giving a prognosis.

Treatment.—In very rare cases, such as those described by B. Fränkel, laryngeal growths have been coughed up, and thus a spontaneous cure effected. Cases are occasionally met with (*e.g.*, case of multiple papillomata observed by Dr. Wyllie, which disappeared after wearing a tracheotomy tube for years) where growths have disappeared either spontaneously or after the use of astringent remedies. These facts do not, however, militate against the general statement that innocent neoplasms of the larynx, if so situated as to produce marked discomfort, should be removed by endolaryngeal operation if practicable. The statement that such interference often produces secondary malignant disease has, owing to the researches of Semon (Collective Investigation), been proved to rest upon no basis of scientific fact. In advising endolaryngeal operations, however, I wish to except one class of cases, viz., those of multiple papillomata in which the growths are very numerous, and where dyspnœa is also present. In this reservation I am aware that my opinion is contrary to that held and expressed by many of the first laryngologists. In view, however, of the tendency on the part of warts to recur, and also in view of the fact that the sufferers are generally children, it seems to me that such patients are best treated by thyrotomy, which enables the operator to remove every trace of each papilloma, and further, to apply a caustic or the actual cautery to the base after removal. The operation must, of course, be preceded by tracheotomy and the introduction of a so-called tampon cannula, which effectually prevents blood from getting into the trachea. If this risk be provided against, and if, further, the operator be careful to divide the thyroid cartilage in the middle line, I believe that this method will give as good results, even with regard to the voice, as repeated endolaryngeal operations in cases of multiple papillomata. Thyrotomy must also be occasionally resorted to in growths which are inaccessible from above and give rise to dyspnœa. From what I have seen of this operation, as practised by my surgical colleagues in the Edinburgh Royal Infirmary, I do not look upon it as very dangerous, yet the possibility of a fatal issue would make me hesitate to recommend it where only loss of voice is present; besides, it must be remembered that the successful removal of a tumour by opening the larynx from without is not necessarily followed by restoration of the vocal function; although, as a rule, according to my experience, a somewhat harsh, but by no means unserviceable, voice results.

In the case of single growths, endolaryngeal operation should always be preferred, and it is needless to remark that such interference should be preceded by the application of cocain (*see* Chapter II.)

The most serviceable instrument for this purpose will be found to be Mackenzie's forceps or one of its modifications, as suggested by Gottstein and Hodgkinson. As these instruments have been referred to in a previous chapter we need not discuss them further. In the case of pedunculated neoplasms the growth, when seized, is pulled off; while, if the pedicle be of considerable thickness, cutting-blades enable the tumour to be removed piecemeal. When the growth is very firm, closing the forceps upon it may induce sloughing and consequent relief of symptoms.

Another method of operating is by means of curettes—similar to those suggested by Heryng for the treatment of laryngeal phthisis. Massei especially recommends this proceeding in suitable cases.

When soft tumours grow from the margins of the vocal cords and project into the rima glottidis, the sponge method of Voltolini may be tried. The greatest possible care should, however, be taken to ensure that the sponge is firmly secured to the shaft, while it should also be attached to a thick thread which is wound round the handle.

In the case of neoplasms attached to the free margins of the cords, the probe-pointed laryngeal knife may be employed to sever their attachment. Stoerk seems to operate on most forms of tumour with his laryngeal guillotine; while in the case of small growths, delicate forceps may be used, of which Schrötter's are probably the best.

Caustics, such as nitrate of silver and chromic acid, are sometimes applied in order to destroy small growths or to cauterise the bases of warts which have been removed. For this purpose, however, the electric cautery is more commonly employed. The use of incandescent platinum points must, however, be looked upon as a dangerous proceeding, more especially when they are applied to the vocal cords. No doubt it is justifiable in certain cases, but only in the hands of those who have had a very large experience in laryngeal manipulations.

Snaring is probably the safest of all methods for the removal of such neoplasms as, from their shape and position, are adapted for this form of treatment. The instruments commonly recommended are those devised respectively by Gibb and Tobold. If the tumour be attached by a thin pedicle these are no doubt serviceable; but if there be any doubt as to the ability of the cold wire either to cut through or drag off the neoplasm, it is safer to use the laryngeal electric cautery snare. This can be employed cold, but in case of difficulty the instrument can at all events be detached by burning through the tumour; whereas, if, with the cold snare, the operator fails to cut through or remove the neoplasm, great difficulty is experienced in disengaging the instrument.

MALIGNANT NEOPLASMS.

Malignant disease of the larynx is, unfortunately, far from uncommon. Here, as elsewhere, we must divide malignant tumours into two groups—(1) The carcinomata; (2) the sarcomata.

Laryngeal Cancer.—Very rarely medullary cancer occurs in the larynx, and still more rarely scirrhus. The former is said by Gottstein to appear in the "form of large rapidly disintegrating nodules," while the latter is, according to the same authority, of very "firm consistence," which indeed is the special characteristic of scirrhus wheresoever it occurs.

Epithelioma is the form which is most commonly met with, and although I have seen a very considerable number of cases of malignant disease, it is the only variety I have so far encountered. It is not my intention to repeat the well known facts concerning the structure of epithelioma. I shall content myself by reminding the reader that in the microscopic diagnosis of this variety of cancer it is not sufficient to find proliferating epithelium and cell nests. Before a positive conclusion can be arrived at that a microscopic section gives evidence of malignancy, it is essential to ascertain that the proliferating epithelium actually does penetrate the connective tissue. Without this characteristic the pathologist is not entitled to arrive at the conclusion that a given growth has an infiltrating and therefore malignant character. From the results of Semon's collective investigation, and especially from the study of a remarkable case of supposed carcinoma (after microscopic examination of removed fragments) described by Beschorner, which was afterwards proved, by renewed pathological examination and the clinical course, to be innocent, the question is irresistibly forced upon us whether there may not be a class of cases which so resemble cancer as to be microscopically indistinguishable, but which are not malignant.

Carcinoma of the larynx is commonly primary, but occasionally attacks this organ by extension from the upper part of the gullet or pharynx; very rarely it arises as a sequel of malignant disease of distant organs.

Epithelioma usually commences in the vocal cords, ventricular bands, or epiglottis, but statistics on this point are still at variance. Thus, out of thirty-seven cases, Fauvel found the seat of origin twenty-one times on the ventricular bands, and only once on a vocal cord; while, of fifty-six observations by Semon, in only twenty-five could the starting-point be definitely discovered, and in ten the disease was found to have originated in a vocal cord, and only twice in a ventricular band. It is noteworthy that the experiences of Morell Mackenzie and Von Ziemssen agree more with the observations of Fauvel than with those of Semon.

The *etiology* of laryngeal cancer is as much involved in obscurity as is that of the disease generally. We have no knowledge of the *rôle* played by heredity in its production, nor can it be definitely asserted that excess in alcohol or tobacco are predisposing factors. No doubt malignant disease of the larynx is more common in men; but so are most affections of this part.

That chronic congestion of the larynx, more or less confined to the side upon which the neoplasm afterwards appears, may precede cancer, I have myself seen. Advanced age is a predisposing cause, but comparatively young people are by no means exempt, and Rehn recorded a case occurring in a boy only three years of age. Lennox Browne states that repeated endolaryngeal operations may produce malignant metamorphosis of innocent growths, but the collective investigation, originated by Semon with a view to the elucidation of this point, has definitely disproved the statement.

In considering the clinical characters of laryngeal carcinoma, I shall draw largely upon the results collated by Semon after searching collective investigation, and upon his own observations incorporated therein, which form together the most valuable contribution to this subject which has yet appeared.

According to Semon, epithelioma of the larynx often appears as a pale or pink coloured wart, having a broad attachment to one or other vocal cord. After a time it is noticed that the corresponding cord is congested, and that it moves less freely than its fellow, and this apparently quite apart from the mechanical influence of the tumour. The explanation of this phenomenon is to be sought in the infiltrating character of the growth and the consequent interference with muscular action, and with the free mobility of the crico-arytenoid articulation. Semon also lays great stress upon the extension of the growth backwards, so as to involve the arytenoid region, as evidence of malignancy, for innocent tumours do not commonly occur in this situation.

Another appearance which is highly suspicious is the presence of a papillomatous mass concealing one vocal cord, and confined to one side, occurring in an elderly patient. The same is true of a papillary-looking fringe extending along the margin of a vocal cord. In more than one case of cancer affecting a vocal cord, Newman has observed that infection by contact occurred on the opposite side. Occasionally, also, epithelioma begins at two distinct points where no direct contact is possible, as in the accompanying drawing, taken from a patient observed at the Royal Infirmary, by Dr. Mackenzie Johnston, during my absence.

On the ventricular bands cancer shows itself as a more or less diffuse infiltration, presenting in many cases a distinctly uneven or papilloma-like surface.

According to B. Fränkel, cancer originating in the ventricle may remain masked for a considerable time, as the tumour tends to displace the ventricular band and ary-epiglottic folds, which thus conceal the actual neoplasm.

Epithelioma of the epiglottis usually appears as an infiltrating, warty mass, having the characteristic uneven surface of epithelial cancer.

Subglottic cancer may, up to an advanced stage, run its course without showing distinctive characteristics of malignancy. In one patient, a woman of middle age, I was enabled to study the disease from the beginning, and at first only smooth swellings appeared below the cords, resembling in every respect chronic subglottic laryngitis. My first suspicions were caused by the unusual amount of pain resulting from the introduction of one of Schrötter's bougies. Sometime after this the tumour on the right side showed a tendency to spread above the glottis, and, at the same time, presented an uneven surface. Removal of a fragment enabled a definite diagnosis to be arrived at and complete extirpation of the larynx was performed by Professor Annandale.

In not a few cases of carcinoma the disease is so far advanced when the patient comes under observation that the whole interior of the larynx is filled with an ulcerating, irregular mass. As a rule ulceration proceeds comparatively slowly, and even partial cicatrisation of ulcerated areas may take place. After a time, if life be sufficiently prolonged, and no radical operation be undertaken, perichondritis sets in, followed by necrosis. All these conditions tend to complicate the laryngoscopic appearances, and I do not believe that any surgeon is, from the laryngoscopic appearances alone, entitled to decide between certain cases of advanced carcinoma and tertiary syphilis.

In many cases of cancer the absence of pronounced ulceration, the warty and infiltrating character of the growth, and the fact that the cauliflower-like excrescences are individually of larger size than those of simple papillomata and sometimes show a pronounced whiteness, will enable the experienced laryngologist to suspect the malignant nature of the disease.

In malignant disease affecting the upper part of the œsophagus it is by no means uncommon to see a warty cauliflower-like mass appearing behind the inter-arytenoid commissure.

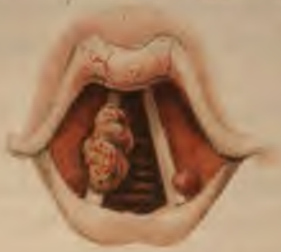

FIG. 15.—Epithelioma of larynx showing two separate warty growths (observed by Dr. Mackenzie Johnston).[1]

From the laryngoscopic appearances described, it may be inferred that the *symptoms* of laryngeal cancer vary within wide limits according to the situation and extent of the disease.

Loss of voice or hoarseness is, in many cases, an early feature, and, according to Von Ziemssen, it not unfrequently occurs years before the manifestation of other marked symptoms, an observation which I can corroborate from my own experience. A laryn-

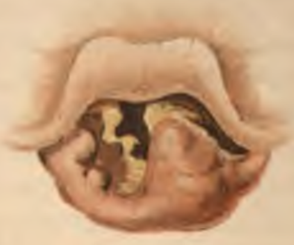

FIG. 16.—Advanced malignant disease.

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[1] This case, when seen some months after the drawing had been made, showed unmistakeable evidence of advanced malignant disease.

geal inflammation, having all the characters of simple chronic laryngitis, but with a marked unilateral character, in so far that one side of the larynx is more congested and infiltrated than the other, occurring and persisting in a middle-aged or old person, and associated with an amount of hoarseness more marked than would be usual in the simple affection, should be viewed with distrust. Dyspnœa is, as a rule, due to mechanical causes, and therefore only occurs when the situation or size of the tumour interferes with breathing space.

Pain may occur early, and often shoots up towards the ears. Although by no means pathognomonic, there can be no doubt that this symptom is most commonly met with in carcinoma and phthisis of the larynx; in the former it is often spontaneous, but in the latter it is usually only excited by deglutition, although many exceptions to both these statements are met with.

Deglutition may, or may not, be interfered with. I have seen cases of carcinoma, in which the patient's chief complaint was that food tended to stick in the throat, where it was caught by the cancerous growth, but in which pain was absent. Even in cancer of the epiglottis, painful deglutition is by no means always a marked symptom.

Swelling of the lymphatic glands of the neck is commonly a late symptom, and may be entirely absent so long as the cancer is bounded by strictly laryngeal structures. According to Butlin's observations, it would almost seem that the probability of glandular infection is directly proportionate to the distance of the disease from the glottic chink. Thus, in cancer of the epiglottis we may expect early implication of the lymphatics, and in the same disease of the vocal cords the glandular involvement is late. Butlin adduces facts which tend to corroborate the views of Krishaber, who believed that extrinsic cancers produce glandular enlargement while the intrinsic do not. He assumes that this peculiarity of laryngeal cancer is due to the inability of the laryngeal absorbents to carry the diseased material to the glands, while he admits that this cannot be explained by reference to known anatomical data.

In an advanced stage of the disease, when diagnosis is or should be no longer doubtful, stenosis of the larynx, fœtor of the breath due to ulceration, hæmorrhage, abscess formation, and even the exfoliation of necrosed cartilage are common results of carcinoma.

As to the *course* of laryngeal cancer, if left to itself, not much remains to be said. The duration of life after the first appearance of a tumour varies, but probably about two years may be taken as an average, while life has been prolonged to six and three-quarter years.

The *diagnosis* of laryngeal cancer is surrounded by difficulties. The infiltrating and often warty character of the growth, the fact that it ulcerates somewhat slowly, immobility or diminished mobility of the corresponding vocal cord, and a degree of hoarseness not accounted for by the laryngoscopic appearances, are all suspicious symptoms. Although simple papillomata are often multiple, and more common in young people, they occur singly, and in those above middle life. As we have seen, the tendency of a warty tumour to pass backwards and involve the arytenoid cartilage is suggestive of malignancy. In the early stages of carcinoma, it is often absolutely impossible to give a decided opinion without removing a fragment for microscopic examination, a point to which I shall again refer.

In the later stages of the disease, or when, instead of having a more or less defined warty character, the disease is present as an ill-defined infiltration, the diagnosis is equally difficult. The absence of pulmonary disease, very often the age of the patient, and the congested appearance of the mucosa covering the infiltration, associated with the history, the absence of bacilli, and other symptoms, will usually suffice to exclude phthisis. Syphilis, however, cannot usually be put out of court with the same ease. It is true that gummata, as a rule, ulcerate early, but exceptions may be met with, and in many cases the diagnosis can only be arrived at by the exhibition of iodide of potassium. The surgeon must, however, be cautious in drawing an inference from the action of this drug, as it not unfrequently, by diminishing the force of the circulation and by producing absorption of inflammatory products effused in the neighbourhood of cancerous deposits, produces marked temporary amelioration even in malignant cases.

When cancer of the larynx has advanced to ulceration, the diagnosis is still difficult; indeed, in many cases the laryngoscopic appearances of tertiary syphilis cannot be distinguished from malignant disease. If the epiglottis is destroyed at its margin this is strong presumptive evidence of syphilis, but here again the effects of antisyphilitic remedies must often be relied upon.

In doubtful cases the diagnosis can sometimes be made by the removal of a fragment for microscopic examination. It is, however, just in those cases in which no other means of differentiation remain that this method often fails to afford conclusive evidence. Thus, in the case of a warty growth of doubtful character, microscopic examination of a fragment so removed may indicate that the portion of the tumour obtained is non-malignant; but it in no way proves that the neoplasm as a whole is innocent. On the other hand, as we have already seen, even eminent pathologists (*e.g.* Beschorner's case, referred to previously), may consider histological evidence of malignancy to exist in sections of a tumour which runs a clinical course only consistent with non-malignancy.

The *treatment* of laryngeal cancer is still a much debated question. While, at a period not very remote, the disease was looked upon as a *noli me tangere*, the tendency among surgeons of to-day is all towards operative interference. As a rule, only cases are looked upon as suitable for operation in which the disease is limited to the interior of the larynx, and in which the glands have not yet become involved. In this relation, however, it must be remembered that every enlarged cervical gland in a patient suffering from malignant disease of the larynx is not necessarily cancerous, but may be simply inflammatory.

Is endolaryngeal interference justifiable in cases of cancer? In discussing diagnosis, I referred to the removal of a fragment of a doubtful growth as a method calculated sometimes to afford valuable aid in arriving at a conclusion as to the nature of a doubtful tumour. Newman, however, is of opinion that this should not be done unless the patient has previously agreed to an external operation for the removal of the disease, should the result of microscopic examination prove unfavourable; and in support of this view he describes cases in which endolaryngeal operative interference undertaken to establish a diagnosis was followed by rapid growth of the cancer. B. Fränkel, on the other hand, advocates an attempt to remove all the diseased tissue by means of endolaryngeal operation alone, where the tumour is so situated that this can be attempted with any prospect of success. In the first case in which this method was adopted, the patient, an old man, had not only laryngeal cancer, but also an enlarged cervical gland which was removed, and on microscopic examination found to be cancerous. Between 1881 and 1884 the laryngeal disease was repeatedly removed, and for five years the patient[1]—now seventy-seven years of age—has been quite well and speaks with a good voice. In four more cases the same method of treatment has been adopted by this authority, but the other recorded cases do not seem to me to be as conclusive as the one referred to. Semon and Schnitzler have also treated cases in which a cure has resulted from endolaryngeal operation alone. Fränkel usually operates with cutting forceps and a cold wire écraseur. It is impossible, at present, to express a decided opinion as to the merits or demerits of this procedure, and further experience alone will decide upon the expediency of adopting it.

Operations by means of external incision are the recognised methods of treating malignant disease. When the cancer has invaded both sides, complete extirpation of the larynx is usually adopted if the patient decides to run the risk involved rather than face an inevitable lingering and painful death. According to Scheier's statistics (compiled in 1888) of 68 cases of total extirpation, 18 died within a fortnight, 5 within six weeks, in 17 recurrence took place (15 within 9 months), 6 died of intercurrent diseases, 13 were observed during too short a period to warrant a definite conclusion, while in 9 no recurrence had taken place at periods varying from 16 months to 2½ years. From these facts we must draw the deduction that the operation is only justifiable after the risks have been fully explained to the patient and his relatives. After complete extirpation the introduction of an artificial larynx enables the patient to speak in an audible if monotonous voice. A very remarkable case has been recorded by Hans Schmid in which no artificial apparatus had been introduced, and where no communication existed beween the pharynx and trachea, but the patient was able to speak with a loud voice. The phenomenon was explained by the existence of a space behind the root of the tongue, which could be filled with air and compressed by muscular effort, while the tongue was so placed as to leave only a narrow chink between it and the pharyngeal wall.

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[1] *I.e.*, in 1889.

Partial excision of the larynx is suitable for cases in which the disease is unilateral, and is associated with less risk than total extirpation. Of twenty-three cases collected by Scheier, five died within six weeks, in five recurrence took place within 16 months, in eight subsequent history was incomplete, and in five life was prolonged for 19, 18, 27, 36, and 84 months respectively. In some cases opening into the larynx, followed by the removal of all the diseased soft parts, without interfering with the cartilage, has been practised. In 1887 Solis Cohen was enabled to describe the laryngoscopic appearances in a patient upon whom he had operated in this manner, and removed the greater part of the left vocal cord and ventricular band twenty years before. In this case the voice had become good, owing to compensatory movement of the right vocal cord. This operation is probably less directly dangerous to life than partial extirpation, and I am not aware that it has been proved to be less efficacious, while its performance is advocated by no less an authority than Butlin.

To sum up, there can be no doubt that the question as to the best method of operating is still *sub judice*; but, on the whole, in suitable cases opinion seems to favour partial extirpation when compared with simple thyrotomy and removal of soft parts.

In estimating the dangers of these external operations account must be taken of the risks of simple tracheotomy—which, be it remembered, usually becomes inevitable in all cases of cancer if the patient's life be sufficiently prolonged—for, of seventeen cases of tracheotomy collected by Scheier, seven died within eight days. I cannot but think that the statistics of Edinburgh surgeons, were they collected, would show much better results.

It is not my intention to consider the methods of performing the operations referred to, as this is the domain of the general surgeon.

The laryngologist meets with numerous cases in which the disease has advanced beyond hope of radical cure. As has been stated, tracheotomy is usually necessary to relieve dyspnœa, if life be sufficiently prolonged. Fœtor may be palliated by antiseptic sprays or vapours, and sucking menthol pastilles, which are also valuable on account of their anæsthetic action. Pain may also be relieved by spraying with cocain, or the insufflation of morphia. In all hopeless cases I think it my duty to give Chian turpentine—although in my hands this drug has achieved no definite results—which is usually best exhibited in the form of a mixture, owing to the inability of the patient to swallow pills. Of tincture of Thuja, lately recommended in France, I have had no experience.

LARYNGEAL SARCOMA.

Sarcoma of the larynx is comparatively a rare disease, and in 1883 Butlin was only enabled to collect twenty-three cases. Other cases have since been added, but they are not numerous. As a rule sarcomata spring either from the vocal cord, ventricle, or ventricular band. They commonly appear as distinct tumours, but present no distinguishing characteristic except that they are usually sessile and smooth. In colour they vary from a very pale to a deep red, with sometimes a livid tinge. Ulceration has not been commonly observed, while the consistence of the growths is usually hard. According to Butlin's collected cases the disease is most common between 24 and 60, thus allowing very wide limits of age, while the youngest patient was 7 and the oldest 74.

In sarcoma the glands of the neck are affected even more rarely than in carcinoma, while the actual tumour usually tends both to recur after removal and to infiltrate adjoining parts, thus giving evidence of malignancy. Sometimes in sarcoma the tumour is not circumscribed, but appears as a diffuse infiltration or swelling. In this connection I shall detail briefly a case of unusual interest which was recently under my care. The patient, a man of middle age, complained of laryngeal symptoms, and on laryngoscopic examination it was seen that the right vocal cord was embedded in a diffused infiltration of slightly uneven aspect. Iodide of potassium was administered, but the tumour still continued slowly to increase. It was perfectly evident that the case was one of infiltrating tumour, and, therefore, clinically malignant. A portion of the mass was removed with cutting forceps and sent to a pathologist for examination, with a request for a report as soon as possible. This was given from an examination of the unhardened specimens alone, and they were declared to consist of layers of rapidly proliferating epithelium. After the operation of removing the piece for examination, the tumour increased so rapidly that, to avoid extension to the opposite side, unilateral excision of the larynx was performed by Prof. Annandale. Microscopic examination of the mass then showed that the tumour consisted of myxomatous tissue only, which, however, infiltrated the laryngeal structures and even separated muscular fibres. In the cartilage a very few round cells were found, but these may have been simply inflammatory, and were, according to Dr. Woodhead, unlike sarcomatous elements. It may also be mentioned that sections of the fragment removed before the major operation, examined after hardening, presented beautiful examples of myxomatous tissue. In the ordinary sense of the term, this growth was certainly not a sarcoma; and histologically it was innocent, while clinically it was malignant.

The *diagnosis* of sarcoma is extremely difficult, as, in appearance, the tumour may resemble a papilloma or fibroma if it be circumscribed, and a cancer if diffuse. To a certain extent, it is true, microscopic examination of a fragment will afford aid; but considering the histological similarity between sarcomata and simple connective tissue tumours, the diagnosis must always rest mainly upon clinical facts. If the growth recurs rapidly after removal, and, above all, if it tends to invade adjoining parts by infiltration, we have evidence of clinical malignancy.

The *prognosis* of sarcoma is, of course, always grave, but less serious than in cancer.

In certain cases of diffuse infiltrating sarcoma, extirpation of half or even of the whole larynx is required, according as the disease is unilateral or bilateral. Permanent cures may, however, where the sarcoma appears as a circumscribed tumour, result from endolaryngeal operation alone, as exemplified in the practice of Türk, Morell Mackenzie, Navratil, and Gottstein. In view of these favourable records, it is not improbable that —where complete endolaryngeal removal is impossible in the case of a circumscribed tumour—thyrotomy may be ultimately found to be the most efficient means of treatment, provided that this operation permits of the removal of all the diseased tissue.

HYPERTROPHY OF THE LINGUAL TONSIL.

I have introduced here a description of an affection which can, in most cases, only be satisfactorily diagnosed by means of the laryngoscope. Hypertrophy of the lingual tonsil is, as its name indicates, purely a hyperplasia of the lymphoid tissue situated on the dorsum of the tongue, behind the circumvallate papillæ, and in front of the attachment of the epiglottis. In this region glandular tissue is normally present, but not in such quantity as to produce a visible prominence. Although hypertrophy of the lingual tonsil had previously been observed by Stoerk, Heymann, Betz, Michael, Curtis, and Rice, the first systematic account of the affection was by Swain, who based his remarks on an analysis of 190 cases.

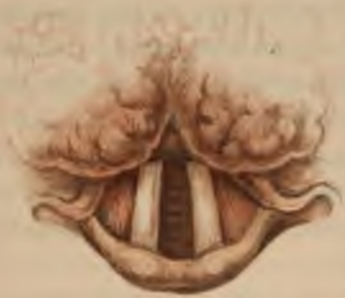

FIG. 17.—Hypertrophy (very marked) of lingual tonsil.

Hyperplasia of the lingual tonsil, contrary to what is the case with regard to the faucial and pharyngeal tonsils, is most commonly met with in adults, and the symptoms produced vary according to the sensitiveness of the patient.

As a rule, in the normal throat, the epiglottis, when observed with the laryngoscope, is so situated that its free margin is at some distance from the dorsum linguæ. If, however, the latter be thickened from hyperplasia of the adenoid tissue, contact results between two parts not normally in apposition. If this occurs in a person of neurotic constitution, the subjective sensation of a foreign body is experienced, and considerable discomfort is caused. This is by far the most common symptom, but occasionally pain is complained of, and if the hypertrophy be so marked as to impede the free movement of the epiglottis in speaking, the voice is easily fatigued. According to Rice, cough is occasionally due to the condition under discussion, and interference with deglutition and even with respiration may occur; indeed hypertrophy of the lingual tonsil when marked (as in the accompanying drawing), may give rise to very considerable distress. The *diagnosis* of the condition, which is more common among women than men, is comparatively easy. In health, unless the epiglottis be unduly flexed from behind forwards, its tip lies free. In hyperplasia of the lingual tonsil the free space is filled up with an uneven mass, presenting a nodular appearance, and showing a central furrow; sometimes, in marked cases, each lateral mass is again furrowed in various directions.

If the affection be slight, the tip of the epiglottis may not be in contact with the dorsum linguæ when the tongue is protruded, but, on introducing the mirror, while the tongue is retained within the mouth, the parts may be seen to be touching one another.

Again, in very marked cases, such as the one figured, the epiglottis may be seen to be entirely embedded in the glandular hyperplasia.

In slight cases, it is desirable to ascertain whether the symptoms complained of are really due to the small amount of hypertrophy present. If they disappear after painting the upper surface of the epiglottis and adjacent part of the tongue with a 10 p. c. solution of cocain, they are probably referable to this cause.

The *treatment* of the affection—which beyond the symptoms it causes is harmless—must vary according to the indications so afforded. In slight cases, painting the tongue with iodised glycerine and the administration of tonics, together with a regimen calculated to remove nervous irritability, will be sufficient.

In well marked examples, the application of the electric cautery to the hypertrophied area is undoubtedly the best treatment. Instead of the electric cautery, chromic acid or nitrate of silver may, however, be employed. In the case from which the drawing was taken the hyperplasia was so excessive that the galvano-caustic snare was resorted to with success.

I cannot conclude this consideration of an affection which has only recently been described, and upon which I was, I believe, the first British writer, without a word of warning. Well marked hypertrophy of the lingual tonsil is by no means very common, and when it is very slightly developed and yet appears to produce symptoms, this fact is commonly due to increased nervous irritability. Very often the patient is anæmic or hysterical, and general treatment alone is sufficient. It is only when the neurotic state, which leads to the production of symptoms, has been remedied, or has been proved irremediable, that the use of the electric cautery is justified in cases where the hyperplasia is of small extent.

CHAPTER VII.

VARIOUS CONDITIONS.

CICATRICIAL AND CONGENITAL MEMBRANES.

As we have seen, cicatricial membranes may form in the larynx as a result of ulcerative processes. The one which especially often gives rise to web-like formations is syphilis, although the same result may follow various other diseases, *e.g.*, Stoerk's blennorrhœa, tuberculosis, typhoid, and variola. As we shall see in the present chapter, membranous adhesion between the vocal cords may also result from injury, such as cut throat. Considering the frequent association of laryngeal webs with syphilis, it is of great importance to bear in mind the possible existence of this condition as a congenital abnormality.

According to the observations of Schrötter, the vocal cords do not always, even in health, meet each other at an acute angle; the point of junction may be represented by a curve, or in some cases a rounded fold is seen below it. This peculiarity when exaggerated may give rise to the formation of a distinctly obstructing membrane. These congenital webs are sometimes double, as in a case recorded by Turbelle, where not only were the anterior portions of the ventricular bands connected by a septum, but a membrane also stretched between the corresponding portions of the vocal cords. Seifert has placed on record a series of observations on a father and three children, in all of whom there was more or less tissue connecting the vocal cords, but in only one were the voice and breathing materially impaired. Vivian Poore described the case of a girl of thirteen, who was not hoarse, but spoke with a falsetto tone, and who had always been liable to attacks of difficult breathing when she caught cold. On laryngoscopic examination, a "web uniting the anterior thirds of the vocal cords, perfectly symmetrical, smooth, apparently covered by healthy mucous membrane, and with the posterior border concave," was seen. Poore arrived at the conclusion that the condition was congenital on the following grounds:—(1) The patient's voice had always been peculiar since her first cry. (2) She had been liable to attacks of dyspnœa from earliest infancy. (3) There were no appearances of past inflammation or disease. I have quoted this case because it corresponds in almost every detail with that of a patient observed by myself. In these instances a grave mistake would be made were the physician to consider the abnormal condition to be due to syphilis. In the latter, and also in stenosis resulting from other forms of ulceration, cicatrices and infiltration or thickening are almost sure to co-exist. The treatment of membranous strictures—whether congenital or acquired—must vary according to the consistence of the membrane and the symptoms produced.

If the voice be fairly good and respiration not impeded, all surgical interference is to be deprecated. An approximate idea as to the thickness of the membrane may probably, in most cases, be obtained by through illumination, although I have not yet tested this method in one of these cases. If interference be resolved upon, and if there be reason to believe that the obstructing tissue is not of any great thickness, endolaryngeal operation should be attempted. Schrötter suggests that a small hole should be made, either with the knife or electric cautery, in the anterior part of the membrane. This orifice is dilated with a probe, and a knife is then used to cut backwards along the edge of the vocal chord until the posterior margin of the web is almost reached; a similar incision is next made on the other side, and the almost severed tissue extracted with forceps. The glottis is afterwards kept open by means of bougies. In cases where this proceeding is impracticable, attempts may be made to divide the obstruction with the knife or electric cautery, the parts being thereafter kept apart by bougies. In some cases Newman's method of using tupelo dilators may be employed, which proceeding can, of course, only be carried out after tracheotomy has been performed. For this class of cases various cutting dilators have been suggested by Whistler, Lennox Browne, and others; but, on the whole, the opinion and experience of laryngologists is in favour of the methods I have discussed. When all attempts at endolaryngeal operation have proved unsuccessful, resort must be had to thyrotomy and removal of the obstructing membrane, followed by the methodical use of bougies to prevent its recurrence.

INJURIES OF THE LARYNX.

It is not my intention to consider at length the various lesions of the larynx. The most common is cut throat—a subject which is fully discussed in every surgical text-book. It may not be out of place, however, to call to mind the fact that in these cases suffocation may be due to a fragment of epiglottis or arytenoid cartilage, which has, after being severed, dropped into the trachea. Dyspnœa may also be due, in the further progress of the case, to such conditions as œdema, perichondritis, and submucous hæmorrhage. Finally, stenosis of the larynx may persist, and is then due either to distortion of the parts, or to the formation of a membranous web across the glottis. The treatment of this last-named condition has been fully discussed in the preceding section, and must be conducted on the lines there laid down.

Fracture of the larynx is also considered in most works on general surgery. This accident is commonly due to violent compression of the parts (throttling) or to a blow. It is more common in elderly persons in whom the cartilages have begun to undergo ossification, while the part most likely to suffer is, as might be expected, the thyroid.

The *symptoms* are pain, cough, expectoration tinged with blood, interference with phonation, and respiration. Examination with the laryngoscope will demonstrate changes in the interior of the larynx, while palpation and inspection of the exterior may indicate displacement and elicit crepitus. If the mucous membrane be ruptured emphysema may rapidly develop.

In the *treatment* of fractured larynx it is probably better to perform tracheotomy at once whenever the condition is recognised, otherwise a sudden access of suffocation may be followed by death, and this is true even of cases in which breathing is not markedly embarrassed in the first instance. Local remedies must be employed to subdue the tendency to inflammation, and ice may be used for this purpose. I have never had to treat a fractured larynx; but on theoretical grounds it seems probable that the introduction of one of O'Dwyer's tubes, associated with gentle pressure from without, would form a combination approaching—as nearly as the special anatomical relations of the larynx admit—to recognised surgical principles as applied to fractures generally.

FOREIGN BODIES IN THE LARYNX.

The foreign bodies which most commonly gain access to the larynx are particles of food, fish or meat bones, pieces of meat, and the like. Occasionally metallic or other objects, such as coins, buttons, and pins, are drawn into the upper air passages. Foreign bodies sometimes enter the larynx during sleep, narcosis, or intoxication. Morell Mackenzie met with a case in which a child had, during sleep, drawn into his larynx a miniature toy engine, which he had kept in his mouth after going to bed. A still more remarkable case has been described by Schrötter, where a patient aspirated a complete set of false teeth, and only knew what had happened when he missed his plate.

Among substances which have rarely been met with may be mentioned leeches and a coughed-up bronchial gland. Solis Cohen states that sometimes the epiglottis becomes drawn into the rima glottidis, and acts as a foreign body.

The *symptoms* will vary with the size and shape of the foreign body. If it be large enough to close the glottic orifice death may be almost instantaneous, although even then much will depend upon its position.

Small objects, such as fish bones, needles, and pins, may give rise to pain, and usually produce cough; eventually they may cause marked dyspnœa, due either to spasm or secondary inflammation.

The *diagnosis* depends partly upon the history of the case, but chiefly upon the result of laryngoscopic examination; or—if this be impossible—upon palpation. If the extraneous substance be of any size it can usually be seen with the laryngoscope. Such an examination should be most carefully conducted, and no part left unexplored—special attention being given to the pyriform sinuses and ventricles. Occasionally a bruised or abraded surface may be seen, indicating that a hard substance has been in contact with the mucosa; but the actual foreign body may have passed onwards either into the trachea or œsophagus. Neurasthenic individuals not infrequently imagine that they have a foreign body in the larynx, when no such substance exists. In eliciting the history it is important to determine whether or not much coughing has occurred at the time of the accident. Even if nothing abnormal be seen in the larynx the chest should be carefully examined, and the patient kept under observation. It is also advisable to test the power of swallowing, as such a substance as a bone may have passed the larynx and become arrested in the œsophagus. In the case of young children, laryngoscopic examination is often unsatisfactory, and it must then be replaced by digital exploration.

The *treatment* must be energetic in proportion as the symptoms are urgent. If there be either constant dyspnœa or repeated dangerous spasm tracheotomy should be performed at once. On the other hand, if there be no symptoms immediately threatening life, the larynx should be sprayed with a solution of cocain, and an attempt made to remove the impacted substance with laryngeal forceps.

In the case of smooth, rounded bodies, holding the patient with the head down may be successful.

It is of the utmost importance in all these cases that the patient should be kept under observation with a view to tracheotomy. When this operation has been performed endolaryngeal manipulation can be resorted to for the removal of the substance. If, however, this be found impracticable, the larynx may require to be opened, and extraction accomplished after thyrotomy has exposed the parts.

It has been recommended to employ laryngeal forceps while the patient is partially under the influence of chloroform, and Schrötter actually succeeded in operating by the endolaryngeal method upon a child who was completely anæsthetised.

CHAPTER VIII.

NEUROSES OF THE LARYNX.

NEUROSES OF SENSATION.

Anæsthesia.—Under this heading it is not proposed to include those cases which are now and then met with in persons of robust health who can tolerate manipulation of the larynx with exceptional ease. Such a condition can in no sense be considered a manifestation of disease.

Actual anæsthesia may result from general and local anæsthetics, such, for example, as chloroform and cocain. It is also said to occur in hysteria, during epileptic fits, and during the later stages of cholera, while it is found in bulbar paralysis, and Lennox Browne has met with it in general paralysis of the insane. Gottstein observed complete anæsthesia in a case of hemiplegia, and states that Longhi has recorded a similar case. Probably the most common cause of bilateral anæsthesia is diphtheria, when it is usually associated with motor paresis of the larynx and palate. Unilateral anæsthesia, with or without motor paralysis, has been met with in apoplexy, unilateral lesions of the medulla (softening, hæmorrhage, tumours), tumours of the base of the skull, gummata (usually situated near the Pons, according to Löri), locomotor ataxia, progressive muscular atrophy, and railway spine. The physician, after perusing this list, will hardly require to be reminded that in many of these conditions the anæsthesia may be associated, not only with motor paralysis of the vocal cord, due to involvement of the spinal accessory nucleus or nerve, from which it is now probable that the motor supply of the larynx is derived through its communication with the vagus, but also with symptoms pointing to involvement of adjacent nerves, such as the glosso-pharyngeal and hypoglossal. In this connection it must, however, be stated that recent experiments by Grabower have again thrown doubt upon the question of the motor supply of the larynx, for this author states that his investigations point to the motor filaments being contained in the vagus before its junction with the spinal accessory.

In total anæsthesia one of the most marked symptoms is a tendency for food or drink to enter the trachea, where its presence gives rise to cough and choking. This is a grave danger, as the presence of foreign matter in the air passages is liable to produce pneumonia. On laryngoscopic examination, it is stated by authors that the epiglottis is more erect than usual, owing to paresis of its depressors (thyro- and ary-epiglottic muscles), which are said to be supplied with motor filaments by the superior laryngeal nerve. When this nerve is paralysed the crico-thyroid muscles lose their innervation, and, according to Morell Mackenzie, this condition can be detected by applying the fingers to the crico-thyroid space on either side during phonation, when a want of tension is observed. The same author also describes a wavy outline of the glottis in these cases, which he considers due to deficient action of the muscles in question. In one-sided anæsthesia I have observed a great tendency to the accumulation of saliva and mucus on the insensitive side.

These laryngoscopic appearances are, however, of small account in the diagnosis of anæsthesia, which can only be made by touching various parts of the larynx with a probe. This is not perceived by the anæsthetic areas, nor does it give rise to cough or reflex closure of the glottis. At the risk of repeating myself I must here again refer to the importance of noticing concomitant motor paresis of the larynx, tongue, and pharynx, while sensation should also be tested in the last-named situation.

The *prognosis* of anæsthesia must, of course, depend upon the cause. The diphtheritic form usually passes off after some weeks, while in those instances where loss of sensation depends upon serious changes in the medulla or its neighbourhood, both the symptom and the cause are often uninfluenced by treatment.

The most important indication in *treatment* is to prevent food from passing into the air passages, and this is best accomplished by feeding with an œsophageal tube; after this has been introduced it is well to make the patient cough, in order to prove that it has not entered the glottis. If the cause of the anæsthesia admits of a cure, such remedies as electricity and the subcutaneous injection of strychnine may hasten the return of sensibility.

Paræsthesia and Neuralgia.—Paræsthesia, in other words a feeling as of a foreign body, of constriction, heat, pricking, and the like, in the throat, is a common symptom in hypochondriacal, but especially in hysterical patients. After a foreign body has been removed the patient often continues to experience the subjective sensation of its presence, but this is probably to be accounted for by the mechanical shock to the nerve endings of those parts with which it has come in contact.

In true *paræsthesia*, the larynx is either absolutely normal or anæmic. When the latter condition exists, the physician should not neglect to examine the lungs, for abnormal sensations in the larynx may exist as the forerunners of phthisis. Before arriving at a diagnosis of paræsthesia, every pathological condition which might account for the symptoms must be excluded. In this connection, it is of the utmost importance to study the condition of the lingual tonsil, hypertrophy of which is so liable to cause the feeling of a foreign body.

Neuralgia of the larynx is an uncommon affection, and when it exists, the diagnosis can only be arrived at by excluding all morbid conditions liable to cause pain.

The *treatment* in both paræsthesia and neuralgia must be directed towards improving the general health. If the patient be hypochondriacal, his digestion should be regulated, and change of air and scene advised. In gouty persons, restricted diet, associated with Carlsbad water, taken either abroad or at home, may prove useful, while in rheumatic individuals, iodide of potassium may be found of value. In most cases of paræsthesia, however, anæmia is met with, and the patients are often hysterical women. Iron, arsenic, and valerianate of zinc with asafœtida will then be indicated; while a diet as large and liberal as is found consistent with perfect digestion, fresh air, prolonged hours of sleep, and avoidance of mental or bodily fatigue should be enjoined. Sea bathing, massage of the throat, and cold sponging will also hasten the disappearance of the abnormal sensations.

Sometimes the local application of nitrate of silver is serviceable, while, where pain is severe, menthol may be employed either as an injection or pastille. Cocain gives relief, but it is not advisable to recommend repeated application of this drug in chronic cases. Quinine and antipyrin may be given with advantage in neuralgia of the larynx. In some instances the constant current, with the positive pole applied to the neck, has been found useful. Where pain is very severe, Gottstein recommends the application of cloths wrung out of very hot water to the neck. There can be no doubt that laryngeal paræsthesia and neuralgia are most obstinate conditions in many instances where they are not dependent upon such an easily remediable condition as simple anæmia.

SPASMODIC AFFECTIONS.

Spasm of the Larynx in Infants, or Laryngismus Stridulus. —This commonly occurs in children under two years of age. The victims are usually ill-nourished, often rickety, and sometimes micro- or hydrocephalic; enlarged bronchial glands are in many cases the actual cause of the attacks, while emotion, teething, cold, or derangement of the digestive tract may be the direct exciting factor. According to the views of Semon and Horsley, the spasm depends upon cortical irritation.

A typical attack of laryngismus is somewhat as follows. A child under two years of age suddenly gives one or two crowing inspirations, then respiration ceases altogether for a period measured by seconds, during which the little patient's face wears an appearance of intense terror, the lips become cyanotic, the nostrils dilate, the head is thrown back, and the skin bedewed with cold sweat. Suddenly a deep and loud inspiration terminates the attack, unless the patient actually dies of apnœa, a very rare circúmstance. These attacks vary much in severity, and, during the existence of a paroxysm, convulsions may set in. The laryngeal spasm may repeat itself at short intervals for a time, and then may follow a long period of immunity.

The *prognosis* naturally depends upon the strength of the patient and the prospect of removing the primary cause, which is often to be sought in malnutrition and defective hygiene. The *diagnosis* rests upon the suddenness of the attack, together with the absence of fever and symptoms pointing to a laryngeal affection in the intervals of freedom.

If the patient be seen during an attack prompt *treatment* is demanded, the windows should be opened, all tightly-fitting garments removed, cold water applied to the face and chest, while smelling salts are held to the nostrils. It is rarely that these measures are not followed by a return of respiration. If death threatens, no time should be lost in performing tracheotomy, followed, if necessary, by artificial respiration.

As this affection is discussed fully in every work on diseases of children, I shall only refer briefly to the treatment to be adopted in a child prone to laryngismus. The general health must be attended to, the patient's room should be well ventilated, and nutrition encouraged. As over-distension of the stomach is in many instances liable to provoke an attack, food should be given in small quantities frequently—milk and meat being preferred to starchy foods. The bowels must be regulated, cod liver oil with syrup of the iodide of iron is indicated in strumous subjects, while it is often desirable to administer bromide of potassium in order to diminish the irritability of the nervous system. As a matter of course, causes which are known to favour an attack (*e.g.*, cold and emotion) must be avoided.

Laryngeal Spasm in Adults.—Attacks of laryngeal spasm may occur in hysterical patients; they may, however, also be due to the presence of a tumour—aneurismal or otherwise—which is so situated as to irritate without paralysing the pneumogastric or one of its recurrent branches. Spasm of the larynx may occur in epilepsy, tetanus, hydrophobia, and chorea, while in locomotor ataxia it produces the well-known laryngeal crises.

In some persons—usually individuals who are either of neurotic habit or who habitually over-exert their voices—spasm only occurs on attempts to speak, and ceases whenever the effort is abandoned. In these cases, the first effect is inability to produce a sound, owing to the closure of the glottis being complete, and, if endeavours to speak be persevered in, dyspnœa. This is described as *phonic spasm*, and is probably analogous to the condition spoken of by Prosser James as stammering of the vocal cords.

In certain cases, the tendency to spasm seems only to exist during inspiration; in other words, the cords, instead of separating on inspiration, tend to approach one another. Thus dyspnœa results, which, however, always passes off during sleep. There can be no doubt that this condition, when it occurs, is very difficult to differentiate from bilateral paresis of the abductors of the cords. The vocal cords in both are approximated to the middle line, but otherwise normal. In abductor paresis, however, sleep is usually noisy, and simple spasm of inspiration is likely to be associated with other evidences of a neurotic temperament. Both phonic and *inspiratory spasm* are very rare conditions, while abductor paresis is not very uncommon.

It is hardly necessary to enter further into the semeiology of laryngeal spasm. The crowing inspirations associated with anxious countenance, and, perhaps, cyanosis, are sufficiently characteristic. In most cases (except inspiratory spasm), the larynx, both as regards mobility and general appearance, is absolutely normal during the interval.

The ultimate *prognosis* must depend upon the presence or absence of an organic cause, such as tumour or cerebral disease. As regards the attack of spasm, it is probably always favourable. The few cases so far observed of phonic and inspiratory spasm seem to have proved extremely obstinate.

If *treatment* be necessary during the paroxysm, the application of cold water to the face and chest, and, if necessary, a whiff of chloroform will give relief. During the intervals, the cause should be investigated, and, if possible, relieved. In any case the bromides are indicated, in order to reduce, as far as possible, the reflex irritability. As phonic and inspiratory spasm seem usually to be associated with general neurasthenia, constitutional treatment of a tonic character is commonly indicated. Hypnotism has been successful in overcoming the perverted nerve impulse which gives rise to spasm, while Hack has recorded a cure of the inspiratory form by making the patient breathe during laryngoscopic examination, and then directing the breath to be held after a full expiration, so as to excite a demand for air, which caused the glottis to open. Cold douching of the larynx, followed by friction or massage, may also be employed, while the constant current applied to the spine seems to have been followed by success in some cases. On the whole, the number of recorded examples is too small to allow of dogmatism in describing the treatment of phonic and inspiratory spasm.

According to Pitt, spasm of the abductors, causing gaping of the glottis, may be met with in hydrophobia.

Before concluding the subject of laryngeal spasm, it is necessary to refer to three affections, to wit—(1) Mogiphonia; (2) Laryngeal vertigo; (3) Nervous cough.

Mogiphonia.—Under this term, B. Fränkel includes affections of the larynx analogous to writer's cramp, pianoforte player's cramp, &c. Certain cases of phonic spasm which have been just considered belong to this group, and these correspond to the spasmodic variety of writer's cramp. The tremulous form of the latter also has its counterpart in the larynx; but, according to Fränkel, the paralytic variety is the most important. The patient—be he a singer, teacher, speaker, or clergyman, finds singing or accentuated speaking at first difficult and painful, then impossible. The ordinary conversational voice, however, is not affected, and the only abnormality detectable by the laryngoscope is a want of tension on the part of the vocal cords; even this, however, is only noticeable when the symptoms occur.

Methodical massage and friction of the larynx is the only means of *treatment* likely to be followed with success. Electricity seems to be of little value. Kellogg, an American author, in a paper published soon after Fränkel's observations appeared in print, seems to have arrived independently at almost identical conclusions as to professional vocal neuroses.

Laryngeal Vertigo.—This affection was first described in 1876 by Charcot, who considered it analogous to Ménière's disease, the afferent nerve being, according to this authority, the superior laryngeal. Cases of the same affection were afterwards described by Gasquet, Krishaber, Gray, Lefferts, Russel, Massei, Lennox Browne, myself, and others; in all, or nearly all of which the patients were men. Krishaber was inclined to attribute the attacks of so-called vertigo to spasm of the glottis and arrested action on the part of the respiratory muscles. Gray, on the other hand, considers the disease as a form of epilepsy. I believe, however, that the explanation of the phenomena advanced by me in 1884 is that now generally accepted. Before entering upon this, it will be advisable to describe the nature of the affection.

The patient, who may be suffering from pharyngeal, laryngeal, or bronchial catarrh, during a fit of spasmodic cough, becomes giddy, or falls down and loses consciousness for a second or two. He then gets up, feeling rather confused, but usually otherwise quite well. During the paroxysm the face is either pale or turgid, and occasionally spasmodic movements of the face and limbs have been noticed. I may mention that a paroxysm of laughter may produce similar symptoms, as was the case with a patient of my own.

In 1851, Weber pointed out that forced expiration with a closed glottis causes weakened, and eventually arrested action of the heart. Indeed, with such success did this physiologist prosecute his experiments upon himself that he became unconscious, and during this period his face was seen by the bystanders to twitch slightly. In ignorance of Weber's researches, and after observing my first case of so-called laryngeal vertigo, I made somewhat similar experiments, recording the results by means of sphygmographic tracings, and found that, not only did the pulse become much weakened during forced expiration with closed glottis, but that the tracing showed a rapid and continuous diminution of the up stroke. The whole train of symptoms in so-called laryngeal vertigo was thus at once explained. The act of coughing[1] consists of a deep inspiration, followed by attempted expiration, with partially closed glottis. In laryngeal vertigo, however, the closure of the glottis is complete, and the whole expiratory effort is felt through the air contained in the lungs, by the alveoli, the large blood-vessels in the thoracic cavity, and the heart itself. As a result, syncope—or a tendency to syncope—is produced, and almost at the same moment the spasm of the glottis relaxes, and the attack is over. The view here briefly described is that accepted by such authorities as the late Dr.

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[1] The same is true of hearty laughter

Russel, of Birmingham, and Lennox Browne. Those who desire to study the matter in more detail, I must refer to the *Transactions of the Edinburgh Medico-Chirurgical Society*, vol. iii. The *prognosis* in laryngeal vertigo is favourable, although Hugain has recently recorded a fatal case.

As to *treatment*, the chief indications are to keep up the general health, relieve the tendency to spasm by large doses of the bromides, and to remove any co-existing morbid condition of the larynx, pharynx, or lungs.

Nervous Cough.—Nervous laryngeal cough may be defined as a spasmodic, croupy cough, occurring in women and young persons of neurotic type, in whom no affection, usually associated with this symptom, exists. Thus the patient's chest is found absolutely healthy, while neither in the larynx nor in the trachea can any cause be found. However, as Lennox Browne points out, many of these cases are associated with enlargement of the tonsils; at the same time examples are met with where no objective change of any kind can be detected in the whole respiratory tract. As a rule pharyngeal affections do not produce cough, but no doubt neurotic states exist in which irritation, not only of the pharynx, but of the nose, cutaneous surface, and even loud sounds may produce the symptom in question.

The patient—sometimes an hysterical girl or woman, often a neurotic boy—is afflicted with a more or less constant barking cough, which only intermits during sleep, to return on waking. Sometimes the cough is more paroxysmal, and quite commonly, it is of a croupy, and even musical character. This continuous spasmodic cough may be associated with twitching of the face or other parts.

In the *treatment* of this condition any possible source of irritation must be sought for, and, if possible, removed. If the tonsils be enlarged, or the pharynx catarrhal, attention must be directed to these parts, and adenoid vegetations, if present, should be removed. In all these cases the anterior nares should be examined, and even if found normal various parts of the mucosa should be gently touched with the probe. If a spot be thus found, which, when touched, produces cough, this area should be cauterised with the heated platinum point. Even if no definite cause be found, the employment of menthol pastilles may be serviceable, and the drug is perfectly harmless. I cannot but consider it a grave error to prescribe cocain sprays *ad libitum* in such cases, although it may alleviate for a time. As the condition—especially when occurring in children—has much resemblance to chorea, arsenic would naturally be expected to be serviceable. This is actually the case, and I believe that upon this drug the physician's main reliance should be placed. In anæmic subjects it is often useful to give iron as well, while the diet should always be nourishing. Morell Mackenzie speaks highly of the efficacy of change of air and scene, especially in the form of a sea voyage. Schrötter recommends quinine, cold douching while the patient is seated in a warm bath, and the constant current. From the number and variety of remedies suggested it may be gathered that nervous cough is often extremely obstinate, indeed it may last for years. At the same time it seems rarely to injure the health of the patient, much as it may annoy the relatives.

MOTOR PARALYSIS.

It is not my intention to enter into an elaborate disquisition upon a subject so complicated and so uncertain as the innervation of the larynx. It is generally admitted — subject to a confirmation of Grabower's experiments,—that the actual motor nerve of the larynx is the spinal accessory, which unites with the pneumogastric soon after its origin, and that these efferent fibres are carried through the inferior (recurrent) and superior laryngeal nerves to the larynx; for it must not be forgotten that the latter, although chiefly sensory, also contains motor filaments. It must further be remembered that the two recurrent nerves have a different course, that on the left side arising below the level of the aortic arch, while its fellow is given off at the level of the right subclavian artery. Both nerves pass under the large blood vessels named (left recurrent under the aorta, right recurrent under the subclavian artery) and then turn upwards in their course towards the larynx in close proximity to the trachea and œsophagus. As to the actual innervation of individual muscles it has hitherto been assumed that the recurrent nerve supplies all the laryngeal muscles except the crico-thyroid, and the depressors of the epiglottis (ary-epiglottic and thyro-epiglottic muscles). In the main there can be no doubt that this view coincides with clinical experience, although if we accept the recent experiments of Exner, the matter assumes considerable complexity. This authority holds that the crico-thyroid muscles are supplied by the superior laryngeal nerve, part of which, however, he looks upon as really representing the median laryngeal nerve as found in the rabbit. The external portion of the thyro-arytenoid muscle is supplied by the recurrent, but the internal (thyro-arytenoideus internus), receives innervation from this nerve only in its outer part; the inner portion of the muscle is supplied by the superior laryngeal nerve on both sides. The inter-arytenoid muscle varies in its nerve supply, but probably it receives filaments from all four nerves (*i.e.* superior and inferior of both sides). Both crico-arytenoid muscles (*i.e.* lateral crico-arytenoids or adductors and posterior crico-arytenoid or abductors), are said by Exner to receive filaments from the superior and inferior laryngeal nerves; the depressors of the epiglottis are stated to be supplied only by the superior laryngeal. It is also noteworthy that Exner believes that the recurrent to some extent supplies sensory fibres to the laryngeal mucosa. I have mentioned these views held by Exner as an important contribution to the subject; at the same time it must be admitted that the commonly accepted view is more in accordance with observations in cases of paralysis.

It is not my purpose to enter into the subject of anatomy, but at the same time it may prove serviceable to the reader to give a very brief categorical indication of the action of the laryngeal muscles. The crico-thyroid muscle must be looked upon as purely a tensor of the vocal cords, which action it performs by approximating the upper margin of the cricoid cartilage and the lower margin of the thyroid. Tension of the vocal cords is, however, also a result of the action of the internal division of the thyro-arytenoid muscle. The latter, however, together with its external division (the external thyro-arytenoid usually described as a distinct muscle), also acts as a closer of the glottis. This closing of the glottis is also provided for by a circular sphincter-like arrangement of muscular fibres, beginning at the base of one arytenoid cartilage, passing over the apex of the other, and running in the ary-epiglottic fold to the epiglottis (constrictor laryngis or ary-epiglottic muscles); this muscle also acts as a depressor of the epiglottis. The muscles, however, which are most active in approximating the vocal cords, are the inter-arytenoid and the lateral crico-arytenoids; indeed, the latter are generally spoken of as the adductors. It is noteworthy that abduction depends entirely upon the action of the posterior crico-arytenoid muscles or abductors.

Before closing these introductory remarks, it will be necessary to refer very briefly to the central innervation of the larynx. Although Ferrier in 1876, and Duret in 1878, had experimented in this direction, Krause, in 1883, working with the co-operation of Munk, may justly claim to have accurately defined the cortical centre for phonation. He pointed out that in the dog, the region of the gyrus præfrontalis, when stimulated, gives rise to closure of the glottis. When this area was extirpated on one side, there was no appreciable change in the voice; but, when a similar operation was performed on the opposing hemisphere, the animal could only squeak and whimper. Semon and Horsley are at present engaged in re-investigating this matter, and the following is a brief synopsis of the results so far obtained. There is in each cerebral hemisphere an area of bilateral representation of the adductor movements in the monkey, just posterior to the lower end of the præcentral sulcus at the base of the third frontal convolution, and in the carnivora (except the cat), in the præcrucial and neighbouring gyrus. Semon and Horsley, however, differ from Krause in that they have been unable to find any representation of the abductor movements.

These observers found that unilateral irritation of the aforesaid cortical area produced bilateral adduction; but that, on the other hand, unilateral extirpation produced no effect. They therefore conclude that a unilateral cortical lesion cannot cause paralysis of adduction; and that, further, a unilateral paralysis of adduction, due at all events to cortical changes, cannot exist.

In 1885, Hooper pointed out that in dogs, if the recurrent nerves be stimulated, the vocal cords approach each other; but that if the animal be deeply anæsthetised, an opposite action takes place, and a position of abduction results. In the following year Semon and Horsley repeated these experiments and arrived at similar results, deducing therefrom that ether has a different peripheral effect upon the laryngeal muscles, a different metabolism being thus indicated.

After these preliminary remarks, the reader will be prepared to follow me in a short preamble on laryngeal paralysis generally. As we have seen, Morell Mackenzie claims to have diagnosed and demonstrated *paresis of the crico-thyroid* muscle in cases in which the superior laryngeal nerve-trunk was involved. The same author also states that in this affection the laryngoscope reveals a wavy outline of the glottis on phonation. As causes, he mentions cold and over-strain of the voice. It has always seemed to me that a husky voice, associated with a wavy outline of the glottis, following excessive vocal effort—a combination which I have frequently observed—can be best explained by general want of tone on the part of the laryngeal muscles. The indentation of the line of junction of the cords occurs in my experience in the region of the vocal processes, and is probably due to unequal power of the adductors of the two sides—the one vocal process being, in fact, pushed over by the other. In these cases, too, the cords themselves have an undoubtedly flabby appearance, thus showing a distinct want of muscular tone.

The *treatment* should consist in using the interrupted current, saving the voice as much as possible, the occasional employment of coca wine, and remedying any fault in voice production or coincident catarrh of the pharynx, larynx, or nose.

I have mentioned this alleged paralysis of the crico-thyroid muscles, in order to clear the way for a general consideration of the remaining laryngeal pareses. These may be divided into three great classes, viz :—

Paralysis of the closers of the glottis—that is, the lateral crico-arytenoid muscles (or adductors proper), the thyro-arytenoid (the internal tensors of the vocal cords, which also aid in closing the glottis), and the inter-arytenoid muscle.

Paralysis of the abductors or posterior crico-arytenoid muscles.

Paralysis of all the muscles supplied by the recurrent laryngeal nerve.

It must, I think, be assumed that all the forms of paralysis known to clinicians depend upon more or less marked changes in the nervous system—changes which may be purely functional or due to organic lesions. No doubt myopathic-paralysis or loss of function—due to alterations in the muscles themselves—may occur; but our knowledge of them is still in its infancy, and their occurrence is so uncommon that we may leave them out of count in a purely clinical manual.

Paralysis, due to affections of the nervous system, we have already classified, and, with regard to them, I have no hesitation in accepting Semon's law, which, as I understand it, implies that paresis, confined to the muscles which close the glottis, are usually, if not always, due to functional changes in the nervous system, of which we may consider hysteria as the type; on the other hand, paresis confined to the abductors is commonly, if not always, due to organic changes in the recurrent or pneumogastric trunk, or in the medulla. Such changes may sooner or later lead to the third variety, to wit, paralysis of all the muscles supplied by the recurrents.

I have in the preceding lines, perhaps, taken somewhat of a liberty in extending what is known as Semon's law, although I believe my statement actually accords with the opinions Dr. Semon has expressed in his various articles on laryngeal neuroses. Rosenbach was in reality the first author who expressed his belief that in compression of the recurrent trunk the abductor muscles have a tendency to suffer first. Semon, however, soon afterwards, in a series of able articles, abounding in statistics and original observations, proved that in all gross lesions of the recurrent and pneumogastric nerves, and the spinal accessory nucleus in the medulla, the abductor fibres are the first to suffer. Having had access—through the kindness of Dr. Semon—to the manuscript of a work now in preparation, I feel inclined to doubt whether any incontestable evidence can be brought forward as to the existence of laryngeal paralysis due to organic changes affecting the nervous system, and confined to the adductors alone. I am, of course, aware that a number of such cases have been described, but I believe that few, if any of them, have been definitely demonstrated. From the experiments of Semon and Horsley it is extremely doubtful whether there is any organic lesion which can produce unilateral paralysis of adduction.[1] A cortical lesion, which caused bilateral paralysis of the adductors, would have to be bilateral, while it is also conceivable that a cerebral tumour or sclerosis might be so situated as to cut off the laryngeal cortical centres from the spinal accessory nucleus. I am aware that these preliminary remarks have been unduly extended, but they have been rendered absolutely necessary by my desire to provide for the general practitioner a classification of laryngeal paralyses, which is both more simple, and, I believe, more accurate than that usually adopted. In accordance with this wish I shall divide the subject into—(1) Paresis of the muscles which close the glottis and render the vocal cords tense; (2) Paresis due to changes in the recurrent or pneumogastric nerves or in the medulla.

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[1] The cases recorded by Garel have been combated, not as to facts, but as to inferences from facts, as I think successfully, by Semon.

PARESIS OF THE MUSCLES, WHICH CLOSE THE GLOTTIS AND RENDER THE CORDS TENSE.

Paralysis of the Adductors or Lateral Crico-arytenoids.—This is the affection commonly described as hysterical aphonia—a name which, in almost every case, expresses accurately its etiology. It is, as a matter of course, more common in women; occasionally it occurs in little girls. In females there may be simply anæmia with neurasthenia, or the uterine functions may be impaired. Over exertion and sudden nervous shock are also causes which may give rise to sudden loss of voice in neurotic subjects. In some cases the direct exciting cause is an attack of laryngeal catarrh, and functional aphonia has been observed as an early symptom of phthisis.

In these cases the onset of aphonia is usually sudden, and not infrequently there is a history of previous loss of voice, followed by sudden recovery. Such acts as coughing and laughing are usually accompanied by a distinct sound, indicating closure of the glottis; and I have met with a case in which the patient could sing, but could not speak above a whisper. Laryngoscopic examination usually reveals a somewhat anæmic mucosa, while the vocal cords are abducted, sometimes, in a state of extreme abduction, leaving a very wide glottic chink. On directing the patient to say "eh," the vocal bands usually make a rapid movement towards the middle line, but as quickly recede. It is a good plan to hold the tongue firmly, and direct the patient in a peremptory manner to utter "e." The stimulation of the mirror, the unaccustomed experience, and a commanding voice sometimes effect a cure.

As a rule the *prognosis* is favourable, but I have met with a case (seen in consultation with Mr. Cotterill) in which all our efforts at treatment have so far proved futile; yet Mr. Cotterill informs me that the same patient under chloroform speaks with a clear voice.

Closely allied to this affection is the condition described by Solis Cohen as *Apsithyria*—the mutisme hystérique of French authors. In this condition the patient not only loses the voice but is unable even to whisper.

The *treatment* in these cases must be general as well as local. Iron and arsenic should be prescribed for anæmic patients, while avoidance of fatigue and freedom from mental anxiety must be enjoined. The diet should be full, and long hours of sleep are useful in this, as in all neurasthenic conditions. When symptoms of uterine ailment are present these should be attended to, and their cause, if possible, removed. For those who are able otherwise to bear it, a cold shower bath is often valuable, both as a general tonic and because the sudden shock tends to restore the voice. Sometimes this treatment can be borne even by those who have deficient powers of reaction, if the shower be taken while standing in hot water. Cold douching of the throat, followed by friction or massage with lanolin, is often serviceable.

As local treatment, if there be evidence of catarrh, the application of one of the solutions recommended in a preceding chapter will be indicated. In typical cases, however, electricity is most likely to be successful. If an endolaryngeal electrode be not at hand, the interrupted current may be passed through the larynx from side to side or longitudinally from the thyroid to the back of the neck, *i.e.*, one pole in each situation; the sponges may also be placed below the larynx on each side of the trachea. The endolaryngeal method is, however, the best, one pole being attached to a metal plate fixed over the thyroid by a collar, and the other to the electrode. The last named is then introduced so that its extremity is in contact with the interarytenoid fold and a strong current allowed to pass. Semon also advises that the electrodes should be applied to each side of the head, and that thus an attempt be made to act upon the phonatory centres. In very obstinate cases—and those which resist this treatment are few—it is an open question as to how far we are justified in resorting to hypnotism. That this treatment is often followed by success has been demonstrated. Apsithyria must be treated as hysterical, and Charcot here especially advocates hypnotism.

Paresis of the internal tensors of the vocal cords or internal thyro-arytenoid muscles.—Paresis of this muscle alone is usually bilateral. It occurs in neurasthenic persons, and is often associated with anæmia; sometimes it results from over exertion of the voice, and in many cases of laryngeal catarrh, impairment of the vocal function is in great part due to associated deficient action of the internal tensors.

The condition is readily recognised on laryngoscopic examination, when the cords are seen to leave an elliptical space between their margins on attempted phonation, and as a result of the non-approximation of the cords there is well-marked huskiness.

The *treatment* varies according to the cause. Where there are manifestations of catarrh still present, stimulating inhalations (*e.g.*, pine oil or creasote) and the local application of astringents, *e.g.*, powdered alum or a solution of nitrate of silver, will usually be sufficient to effect a cure, if at the same time the voice be not overtaxed.

When the etiological factor has been excessive, vocal effort, rest of the voice, and soothing inhalations are indicated; while if, as is often the case, paresis of the tensors occurs in an anæmic hysterical girl, iron, arsenic, and cold baths followed by friction, will be indicated. In all forms, if the affection be obstinate, electricity will prove serviceable.

Paresis of the inter-arytenoid muscle.—This muscle is occasionally affected alone as a result of catarrh and in hysteria. On laryngoscopic examination the anterior two-thirds of the cords are seen to approximate during phonation, while a triangular cleft is left posteriorly, bounded on either side by the vocal processes. The voice is more or less lost, and sometimes these cases are extremely obstinate. What has been said respecting the treatment of paresis of the adductors and internal tensors applies with equal force to the condition under discussion.

PARESIS OF THE MUSCLES WHICH OPEN THE GLOTTIS OR ABDUCTORS. COMPLETE RECURRENT PARALYSIS.

As we have seen, according to Semon's law, any lesion involving the spinal accessory nucleus and the pneumogastric or recurrent trunks, tends to involve first the nerve filaments which supply the abductors of the vocal cords; afterwards, however, the remainder of the nerve may become destroyed or rendered inactive, and paralysis of both abductors and adductors results. I have, therefore, discussed abductor paresis and complete recurrent paralysis together, because they differ not in kind, but in degree. We must, however, sub-divide the subject according as the paresis is (1) Unilateral; (2) Bilateral.

Unilateral Paresis.—It will be well at first to give in categorical form all the possible causes of unilateral laryngeal paralysis as they have been observed at the bed-side. The list is a long one, comprising apoplexy, softening of the medulla, tumours of the brain and at the base of the brain, multiple cerebro-spinal sclerosis, bulbar paralysis, locomotor ataxia, progressive muscular atrophy, injury of the pneumogastric in the neck during operations, tumours of the neck or aneurism of the carotid, pressing upon the vagus,[1] pressure of intra-thoracic tumours or aneurisms on the pneumogastric trunk (*e.g.*, enlarged glands, tumours of the œsophagus, goitre, aneurisms of the aorta), cancerous infiltration of the nerve, poisoning with lead, arsenic, or atropin, and malaria. So far I have discussed causes which are liable to affect the spinal accessory nucleus in the medulla or the vagus after receiving the motor anastomosis, but before giving off the recurrent branches. These are, however, often pressed upon directly, and among the causes the following may be enumerated:—aneurism of the aorta (affecting specially the left recurrent), aneurism of the right subclavian or innominate arteries, condensation of the apex of the lung (affecting usually the right recurrent), goitre, malignant disease of the œsophagus, malignant disease in the pleural cavity with exudation. As causes which may produce paralysis of motion in the larynx, but which we cannot exactly localise, may be mentioned rheumatism, chronic alcoholism, syphilis, scarlatina, diphtheria, typhoid, and cholera. I have endeavoured in the first place to lay before the reader all, or nearly all, the conditions which have been observed to cause unilateral paralysis of the larynx. At the risk of repetition I must again emphasize the fact that if interference with the vagus trunk occurs, owing to a gross lesion above the junction with the superior laryngeal nerve,[1] anæsthesia of the larynx will result, in addition to motor paralysis; while a tumour so situated as to involve this nerve, at the part named, is also likely to press upon such cranial nerves as the spinal accessory, the hypoglossal, and glossopharyngeal. It must, however, be remembered that an affection of the medulla involving only the spinal accessory nucleus, will produce only loss of motion in the larynx. Let us now extract from the long list of possible causes those which may be termed fairly common.

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[1] If this nerve be affected high up the superior laryngeal may also be involved anæsthesia being then associated with motor paresis.

There can be no doubt that the left side of the larynx is that most commonly paralysed, and that in the great majority of these cases the paralysis is due to an intra-thoracic aneurism. The left recurrent nerve also, owing to its having a longer course within the thorax, is more liable to be pressed upon by intra-thoracic tumours, other than aneurisms, and œsophageal cancer. Intra-thoracic tumours may involve only the vagus, or they may affect only the recurrents, or both may be pressed upon. Common causes—but not so common as aneurism—of laryngeal paralysis are goitres and cervical tumours of other kinds. The right recurrent is stated to be frequently interrupted in its conducting power by thickening of the pleura at the apex, but in my own experience this has not been common. Laryngeal paralysis, due to the conditions affecting the central nervous system which have been enumerated, is not common, but the least rare forms are probably those met with in locomotor ataxia. Syphilis is, in my experience, an unusual cause of laryngeal paralysis, and it is believed by some authors that most of the cases ascribed to this cause have been due to intra-cranial gummata.

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[1] I have recently met with a very interesting case, in which paralysis of one side of the larynx, associated with anæsthesia, was due to implication of the pneumogastric nerve, or of both laryngeal nerves, in a cicatricial mass, resulting from healed strumous ulceration.

Rheumatic paralysis is the name commonly given to cases of paresis pointing to loss of function of the recurrent nerve which recover. There is usually a history of distinct chill, and under treatment the vocal cord recovers free movement, which, I may parenthetically remark, it would probably also do without treatment. I do not believe that these cases can be diagnosed until recovery has taken place, because the presence of a small aneurism or other tumour can never be excluded by the negative result of physical examination. It is, besides, quite as likely that in some of the patients said to have suffered from rheumatic paralysis, the symptom was really due to a temporary enlargement of intra-thoracic glands.

The *symptoms* of unilateral laryngeal paralysis vary considerably. In some cases—those in which there is only paralysis of abduction—there may be no symptom whatever pointing to the larynx. The voice may be slightly altered, or it may not. Respiration, unless on violent exertion,[1] is not interfered with, so that the condition can often only be detected on laryngoscopic examination. This shows the affected cord to be immobile in the middle line or position of phonation. As a result, the larynx appears perfectly normal while the patient is uttering the customary "eh;" but on full inspiration, the healthy cord only moves outwards, and the glottic chink assumes the shape of a rectangular triangle. This phase of laryngeal paralysis (described by German authors as Posticuslähmung, and by English writers as abductor paralysis) exists when there is incomplete motor paralysis due to organic changes, because such changes seem always to affect the abductors first. The experienced laryngologist can sometimes succeed in diagnosing a still earlier stage, when there is only a deficient outward movement of the affected

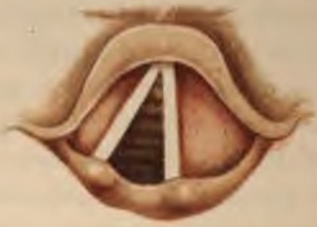

FIG. 18.—Abductor paralysis of left side.

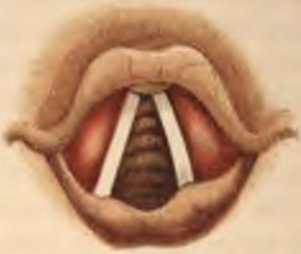

FIG. 19.—Complete recurrent paralysis of left side.

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[1] Roaring in horses is often due to unilateral paresis of abduction.

cord on full inspiration. Although it probably always exists for a longer or shorter time, the abductor paralysis stage may, owing either to its brief duration or to its causing no symptoms, escape observation. The patient then presents the symptoms and signs of recurrent paralysis ("Recurrenslähmung" of the Germans). The voice is now noticeably affected. It is more or less husky, phonation requires an increased effort, and on the patient attempting to speak loud, a falsetto note is often produced. Respiration is, however, perfectly free, unless there be pressure on the trachea or bronchii. Laryngoscopic examination reveals the affected cord immobile in the cadaveric position, —that is, midway between abduction and adduction. Owing to paralysis of the internal tensor, the outline is curved with the concavity inwards. The paralysed cord does not move either on inspiration or phonation; but, during the latter, the opposite cord crosses the middle line, and thus produces an obliquity of the glottic chink. It may be mentioned that the arytenoid cartilage of the affected side is usually seen to move, owing to the action of the inter-arytenoid muscle, which is supplied by the nerves of both sides.

The *prognosis* in these cases must depend upon the cause. It is doubtful, however, whether unilateral paralysis, unless associated with spasm, is ever actually, *per se*, dangerous to life. At the same time the cause of the affection is usually incurable, so that in any given case the probability is much against recovery of movement in the paralysed vocal cord. In so-called rheumatic paresis recovery takes place, but, as pointed out, it is unfortunately impossible to diagnose this class of cases with certainty until the desired event has occurred.

Treatment must be directed to the primary cause, and I consider it useless to employ either strychnine or electricity. In cases in which, from a history of chill as a cause, and in which, owing to the absence of any discoverable factor, paresis is probably due to inflammatory changes, iodide of potassium and the application of iodine over the region of the recurrent nerves are indicated, for even if a small aneurism exists this line of therapeutics will meet indications.

Bilateral Paralysis.—Following the same method as has been adopted in discussing unilateral paralysis, I shall first give a categorical list of all the conditions which may give rise to bilateral paresis, viz.:—bulbar paralysis, locomotor ataxia, amyotrophic lateral sclerosis, progressive muscular atrophy, direct injury to the muscles[1] (*e.g.*, impaction of food), typhoid fever, syphilis, tumours of the œsophagus or thyroid pressing upon both recurrents, intra-thoracic aneurism (*e.g.*, when both the aorta and innominate are affected), and tumours (*e.g.*, case of sarcoma of the mediastinum recorded by Mackenzie Johnston), and pericardial effusion. It is also worthy of note that Dr. George Johnson pointed out that pressure upon one pneumogastric nerve may be followed by bilateral paralysis. In some cases it is quite impossible to ascertain any cause.

As has been repeatedly pointed out, any lesion which affects the motor filaments of the larynx, between their origin (spinal accessory nucleus) and terminations, tends to involve the abductor fibres first. It is also a clinical fact that in certain cases such a lesion is non-progressive—at all events for a long time—in so far as it affects the laryngeal nerves, and in this way bilateral abductor paresis results. On the other hand, if the pathological condition advances, so that all the motor filaments lose their conducting power, both cords assume the cadaveric position (bilateral recurrent paralysis of most authors). It follows from these facts that we may have different clinical phenomena resulting, according to the degree of paralysis.

(*a.*) *Bilateral Paralysis of Abduction.*—As we have seen, this may occur at an early stage of compression, affecting one or both pneumogastric or both recurrent nerves, when, if the patient lives long enough, it is followed by complete paralysis, leading to cadaveric position of both cords, with more or less resulting relief to the dyspnœa. As a comparatively stationary condition it is sometimes met with in locomotor ataxia and other cerebro-spinal affections. It has been observed, as before stated, after the impaction of food in the upper part of the œsophagus, and may exist without any assignable cause. Sometimes it follows syphilis and typhoid fever. I only recapitulate these facts here, because it is desirable that the reader should be enabled to separate from the long list before given, the relatively more common causes of paralysis confined to the abductors.

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[1] In such cases the lesion is traumatic, and may remain confined to the abductors.

The *symptoms* of bilateral abductor paresis are of great importance. The voice is little, or not at all, affected, but a gradually increasing inspiratory dyspnœa is soon developed. At first this is only noticed on exertion, but it gradually becomes permanent. During sleep the stridor is very great, and attacks of spasm are apt to occur if the narrow glottic chink gets closed by mucus.

On laryngoscopic examination the vocal cords are seen to lie near each other. This approximation is most marked on inspiration, and slight separation takes place on expiration.

In a patient who is calm and collected during laryngoscopic examination, *diagnosis* is easy. In some neurotic individuals, however, the introduction of the mirror causes perverted innervation of the larynx, and the glottis tends to narrow during inspiration. The absence of dyspnœa on exertion, and stridor during sleep will, however, usually render mistakes impossible. The differentiation from inspiratory spasm is somewhat more difficult, but here too the symptoms disappear during sleep. I have at present under observation a patient whose vocal cords are fairly normal, but the glottic chink is markedly narrow. In this instance the condition is due to tertiary syphilis, and probably actually caused by an invisible cicatrix in the posterior commissure; the cicatrised epiglottis which shows a distinct central excavation, however, indicates the cause.

The *treatment* of pure bilateral abductor paralysis depends upon the cause. In syphilitic patients iodide of potassium may give marked relief. Tracheotomy is, however, usually called for sooner or later; perhaps in this class of cases intubation by O'Dwyer's method may prove useful. In the only case in which I have seen operative treatment attempted (extirpation of the vocal cords) the result was not such as to encourage its repetition, and this, I believe, is the view of most other laryngologists.

It must be remembered that in those cases which are due to compression, the trachea may be pressed upon lower down, and thus tracheotomy may fail to bring relief.

(*b.*) *Bilateral Complete Paralysis.*—The most common cause of this very rare condition is bilateral pressure either on the recurrents or pneumogastric nerves. As a result of such compression, the mobility of the cords is, in the earlier stages, liable to be involved in different degrees, and the symptoms may undergo corresponding modifications. Thus, one cord may be completely immobile in the cadaveric position, while the other is only abnormal in so far that on forced inspiration it makes too small an excursion outwards. Again, one cord may be in the cadaveric position, and the other may show paresis of abduction only.

In complete bilateral paralysis there is no dyspnœa while the patient is at rest; but the voice is lost, the acts of coughing and expectorating are either impossible or require great exertion, and are even then executed very imperfectly.

In complete paralysis, both cords are seen to be in the cadaveric position, and no movement results on attempted phonation.

The *treatment* in these cases must be directed towards the cause, and it is almost unneccessary to repeat what has been already several times insisted upon—the uselessness of either strychnine or electricity when the fons et origo is such as to make its removal impossible.

THE NOSE.

DISEASES OF THE NOSE.

CHAPTER I.

METHODS OF EXAMINATION.

ANTERIOR RHINOSCOPY.

By the term anterior rhinoscopy is understood examination of the nose so far as it can be accomplished from in front, and for the purpose certain appliances are required, viz. (1) a strong light; (2) a reflector; (3) a nasal speculum.

Into the question of *light* I need not again enter, as the subject has been fully considered in the discussion of laryngoscopy. As a *reflector*, the same may be employed as in examination of the larynx. Or if, as Moldenhauer advises, a mirror of short focal distance be preferred, that used for aural examination may be utilised, attached to a forehead band or spectacle frame, as in operating on the ear. I may, however, mention that proximity to patients suffering from certain forms of nasal disease is not always either desirable or agreeable.

Numerous nasal *specula* have been devised by various writers; but as it is not my intention to introduce an instrumental catalogue, I shall refer merely to those which are in common use. Cresswell Baber points out that in an emergency an efficient instrument can be improvised by separating the prongs of a hairpin to about half-an-inch, and then bending the convex extremity so as to form a blunt broad hook with which the ala of the nostril which it is desired to examine is drawn outwards. B. Fränkel's speculum, composed of two blades of wire separable by the action of a screw, is much used, but although serviceable enough for viewing the parts near the orifice, I do not think it is to be recommended to the beginner. Thudicum's instrument, formed of two metal blades joined by a loop of steel, which, by its elasticity, tends to keep them apart, is, in my opinion, a very serviceable apparatus for operating, but is often disagreeable to patients. The speculum which I employ is that known as the Duplay-Charrière, and is composed of solid metal. When introduced, it has somewhat the shape of a blunt cone, and, by turning a small screw, the blades are gradually separated, so that the yielding parts are pushed aside gently but firmly. The single drawback to this instrument has only to be mentioned to be obviated. As the blades are of solid metal, they conceal the parts immediately within the nostril; it is therefore advisable always to examine these prior to the introduction of the speculum by simply tilting up the tip of the nostril. In this way, such mistakes as overlooking a perforation of the anterior portion of the septum will be prevented.

Having disposed of these preliminaries let us now turn to the actual method of examination. The patient is seated, with relation to the light and observer, as in laryngoscopy. The speculum is introduced, and fixed by means of the thumb and index finger of the left hand. The blades (in the case of the Duplay-Charrière speculum) are then separated by the corresponding digits of the right hand. On directing the speculum straight backwards the eye is at once attracted to the *inferior turbinated body* (*a*) (*i.e.*, the inferior turbinated bone covered by mucosa). This structure is seen to spring like a shelf from the outer wall of the nasal cavity. The mucus membrane covering it is either of a pale or dark pink colour, sometimes, indeed, distinctly red. In outline it is usually smooth anteriorly, but posteriorly it may have a somewhat corrugated appearance.

Not uncommonly this structure is of such a size that it blocks the way to further examination, and only its anterior extremity can be seen. Enlargement of the inferior turbinated body is often due to hypertrophy, the result of chronic inflammation; even then, however, a certain amount of the bulk is usually due to temporary erectile swelling. Under the mucosa in this situation there is an erectile vascular tissue, which has been compared, not inaptly, to the corpus cavernosum of the penis. During inflammatory irritation of the mucosa, erection of this tissue is extremely prone to occur. This is well exemplified by the absolute occlusion of the nostrils, which so often exists on first awaking while suffering from coryza; after a bath, or even after sponging the face and neck with cold water, there is usually an interval of freedom from the uncomfortable nasal stenosis, which illustrates the fact that erection of the inferior turbinated bodies may be relieved by shock. We have, however, another method of arriving at the same result. If erectile swelling be suspected a pledget of cotton wool soaked in a 10 p.c. solution of cocain should be introduced into the nostril and applied freely and energetically to the swollen part. In five or ten minutes the nostril should be again examined, and so much of the intumescence as was due to erection will then have disappeared. Even in the absence of any inflammatory condition, especially in the case of neurotic persons, there may be considerable erectile swelling; this also yields to cocain, so that we have in this drug a means alike of facilitating examination and of aiding diagnosis. The anterior extremity of the inferior turbinated body is seen as a rounded swelling near the orifice of the nostril, and projecting from its outer wall. As I have already stated, the part has much the appearance of a shelf, and can be seen for a considerable distance as it extends backwards. Its free margin approaches the septum, and the space below it is known as the *inferior meatus* (*b*). The inferior boundary of this cavity formed by the floor of the nostril should next be inspected. This is accomplished by making the patient bend his head forwards, *i.e.*, depressing the chin. It is by no means very uncommon to find a longitudinal ridge of bone springing from the lower part of the septum, and covered with more or less congested mucous membrane. It is now desirable to examine *the septum* (*c*). This proceeding requires that the head should be slightly turned to one side, so that the light is allowed to fall upon the part. The lower portions are inspected while the chin is depressed, but the upper parts can only be seen when the head is thrown backwards. It is by no means unusual to find the septum deflected; indeed, I might say that a straight division is uncommon; but in certain cases the deflection is so pronounced as to form an insuperable obstacle to examination of one nostril. Sometimes osseous projections—apart from deflections—occur, which are spoken of by most writers as spines. As pointed out by Bresgen and Cresswell Baber, the upper part of the septum is normally thickened opposite the anterior extremity of the middle turbinated body, owing to an accumulation of glands in this region giving rise to the *tubercle of the*

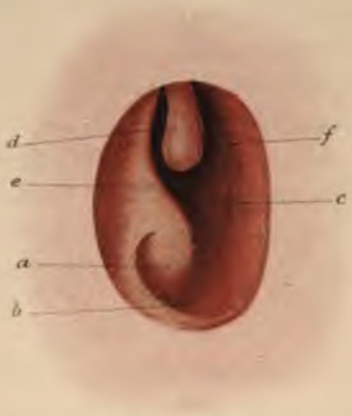

FIG. 20.—Anterior view of right nostril; (*a*) inferior turbinated body; (*b*) inferior meatus; (*c*) septum; (*d*) middle turbinated body; (*e*) middle meatus; (*f*) olfactory cleft.

septum. In order to study the *middle turbinated body* (*d*) and the *middle meatus* (*e*), situated between it and the inferior turbinated, it is necessary to make the patient throw his head back. The middle, like the inferior turbinated, appears like a shelf; but as the bone is always more or less rolled upon itself, so that it presents its inner margin lower than the outer attachment, the lip only may be clearly seen, leaving between it and the septum a slit—*the olfactory cleft* (*f*). The anterior extremity of the middle turbinated bone may be somewhat enlarged, owing to the presence in this situation of a pneumatic space of varying dimensions. If the head be now still further thrown back the middle turbinated body may be seen at its anterior part to curve upwards towards the roof of the nose. The orifices of the accessory cavities cannot, except, perhaps, in some cases of excessive atrophy, be seen. The *outlet of the lachrymal duct* is situated in the anterior portion of the inferior meatus under cover of the inferior turbinated body. Into the middle meatus the orifices of communication with the *frontal sinus* open anteriorly, while somewhat further back is the orifice of the antrum of Highmore. The last-named cavity has not unfrequently a second or accessory communication, situated just above the inferior turbinated body, rather behind its centre.

Before concluding the subject of anterior rhinoscopy it will be desirable to merely mention certain methods which have been practised but have not come into general use even among specialists. Thus Wertheim suggested the use of a fenestrated tube which was inserted into the nostril, and so arranged that a mirror on one side reflected the mucosa exposed through the opening in the speculum. Voltolini adapted similar tubes to an apparatus on the lines of Brunton's otoscope. When long tubes are introduced into the nostril, however, those originated by Zaufal are usually employed. A long narrow speculum is passed along the inferior meatus so far back that the orifice of the Eustachian tube and adjacent parts can be examined.

Unquestionably the desired result can in this way be attained; but except for physiological investigations as to the behaviour of the palate and Eustachian tube on phonation and deglutition, these parts can be inspected more fully and with less discomfort to the patient by means of posterior rhinoscopy.

Examination by through illumination, *i.e.*, transmitted light, was largely practised by Voltolini, who pointed out that this method often enabled estimates to be made as to the condition of the parts through which the light was transmitted, which would have been unattainable by other means. His methods may be briefly summarised as follows:—

(1.) Allowing a strong light to fall on the exterior of the nose, and then introducing a speculum from which all light must, as far as possible, be excluded.

(2.) Throwing a strong light into one nostril while looking into the other.

(3.) Introducing a mirror as in posterior rhinoscopy, and throwing upon it a strong light, while the anterior nares are inspected.

(4.) Introducing an electric light into the mouth and inspecting the nose.

(5.) Introducing a specially constructed electric light into the naso-pharynx. On looking into the mouth the velum is seen to be illuminated, while the introduction of a nasal speculum will enable the observer to examine the anterior nares, especially in their posterior parts.

(6.) Introducing an electric lamp into the mouth and observing the transparency of the antrum of Highmore and cheek. Heryng has elaborated this method of examination, and finds that in empyema of the cavity the affected side is less illuminated than the other—especially if the examination takes place in a dark room. In the case of a solid tumour the transmission of light will naturally be absent, while if the antrum be distended with clear fluid it will be intensified. I have found that in some cases it is extremely difficult to estimate the relative translucency of the two sides, and have, in certain instances, found that inspecting the parts to be compared through a dark tube, which I have named a photoscope, is a very efficient aid. Recently Vohsen has shown that the frontal sinus may also be examined by allowing a strong light to fall upon the inner wall of the orbit.

POSTERIOR RHINOSCOPY.

As we have seen, a limited view of the naso-pharynx may be obtained by using Zaufal's speculum introduced along the inferior meatus. The posterior nares and naso-pharynx can, however, only be properly inspected from behind. It is the custom in works on diseases of the nose to over estimate the difficulties of posterior rhinoscopy. It is true that irritability of the fauces—here as in laryngoscopy—often forms an obstacle, but the employment of cocain usually overcomes this impediment. A very short interval between the soft palate and posterior pharyngeal wall presents a difficulty which can usually be obviated by employing a palate retractor. Perhaps the most serious obstacle to be met with is a tongue which tends to rear itself up towards the palate, and which at the same time resents pressure by inducing retching; for cocain has, according to my experience, very little efficacy in overcoming lingual hyperæsthesia of this type. I shall discuss posterior rhinoscopy under two headings, according as a palate retractor is used or not.

Posterior rhinoscopy without retractor.—For this method of examination the following appliances are requisite, viz.:—(1.) laryngeal reflector; (2.) strong light; (3.) mirror; (4.) a tongue depressor.

The first two are the same as are employed in laryngoscopy. I generally employ the No. 1 mirror, as contained in the Vienna laryngoscopic cases. It is of small size, and the angle which the reflecting surface makes with the handle is smaller than in the mirrors commonly used for laryngoscopy. Michel and B. Fränkel have invented mirrors which can be adapted to any angle by pressing on a spring, and, in some cases, they will be found useful. My reason for not employing them frequently is that their mechanism involves the existence of a delicate hinge, which is liable to be injured by the antiseptic fluid in which every instrument should be washed immediately after use.

The patient is seated as in laryngoscopy, but with the chin slightly depressed, and directed to breathe as much as possible through the nose. If this be not possible, the palate may be found to relax on explaining to the patient that he will be put to no inconvenience, and requesting him to breathe quietly. It has been suggested to make the patient produce a nasal sound, *e.g.*, "ong," but I have not found this method satisfactory. Holding the breath sometimes answers, and at a critical stage, if the palate threatens to spoil the reflection sniffing may prevent its rising; while Spencer Watson advises that the patient should be made to breathe rapidly in short gasps. When the palate is by one of these expedients separated from the posterior wall a tongue depressor is introduced, so that the whole organ is kept down. It is of little importance what instrument be employed, provided only that the hand which holds it be below the level of the mouth, so as not to interfere with illumination; it is, however, of great consequence that the dorsum linguæ should be kept down, and therefore the spatula must be passed well back. The mirror is now warmed as in laryngoscopy, and introduced gently and without touching any of the parts, until its back nearly touches the posterior wall of the pharynx to one or other side of the uvula. What the beginner has to remember is the fact that the parts which are to be first inspected and used as landmarks lie, speaking roughly, between the mirror and the frontal region. The reflecting surface must therefore be directed upwards and forwards.

As a matter of practice this is generally accomplished by slightly elevating the handle. If the light be now upon the mirror the *septum* (a) of the nose is seen, and on each side of it the turbinated bodies. Let us first direct our attention to the former, which appears as a sharply defined, pale pink ridge, narrow in the middle, but widening out both above and below. Sometimes a symmetrical thickening is seen on either side of the centre, but as Voltolini points out, this need not be regarded as pathological. It must be remembered that in using the mirror described, only a comparatively small part of the nose can be seen at once. While the septum is being inspected, however, the turbinated bodies are also brought into view on each side of it, and very slight movements of the hand, the satisfactory execution of which can only be acquired by practice, suffice for a thorough examination of these parts. The *middle turbinated body* (b) usually comes most clearly into view as a somewhat bluish-red mass, springing from the outer wall. Above it the *superior meatus* (f) is occasionally seen, and below it lies the *middle meatus* (c). Only a very limited view can, however, be obtained of this passage. Still lower down appears the posterior extremity of the *inferior turbinated*

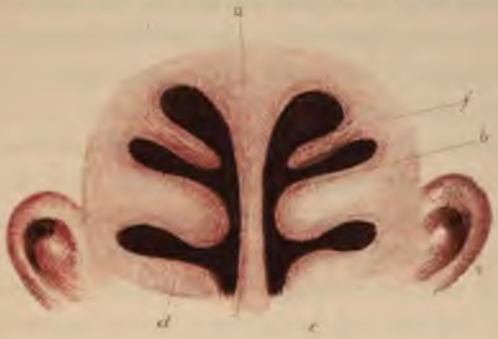

Fig. 21.—Posterior nares; (a) septum; (b) middle turbinated body; (c) middle meatus; (d) inferior turbinated body; (e) Eustachian orifice; (f) superior turbinated body.

body (*d*). It is clearly seen, so far as it appears, and varies considerably in size. Very commonly, however, only its upper half is visible, as the remainder is concealed by the palate. The next important landmark is one or other *Eustachian orifice* (*e*), which is inspected by turning the reflecting surface upwards and to one side. The orifice appears as a distinct hollow, bounded behind, above, and to a certain extent anteriorly, by a very decided ridge, which forms a marked prominence on the lateral wall of the naso-pharynx. The prominent fold which passes downwards from the posterior margin is the plica salpingopharyngea, while in a corresponding relation with the anterior margin is the plica salpingopalatina. Behind the Eustachian orifice is a depression known as *Rosenmüller's fossa*; this, as pointed out by Vohsen, can be best studied when the patient's head is slightly turned to the opposite side. The vault of the naso-pharynx is examined by directing the reflecting surface upwards. In many adults this region is seen to be covered by pale pink smooth mucosa; but in others, and in young persons, it is furrowed and thickened owing to the presence of the pharyngeal tonsil, which is a normal tissue, analogous to the faucial tonsil in structure, and occupies the space between the Eustachian orifices. According to Tornwaldt, there is usually to be seen a foramen in the centre of the naso-pharyngeal vault, the orifice of the bursa pharyngea. Recent researches have, however, rendered it extremely probable that this structure, when it exists, is merely a result of pathological changes in the pharyngeal tonsil. By turning the face of the mirror more or less forwards a view can be obtained of the upper surface of the palate.

Posterior Rhinoscopy with Retractor.—I need not mention the numerous expedients which have been suggested for keeping the palate forward during rhinoscopy, from the "uvula twitch" to passing tapes and india rubber tubing through the nostrils to tie down the refractory part. All these have been replaced by Voltolini's retractor and its modifications. The retractor is a strong flat steel instrument, bent at a right angle near its extremity, and with it the palate is pulled forwards. This manœuvre necessitates that the tongue depressor should be held by the patient; but if it be explained that there will be only a little discomfort, but nothing to hinder breathing during the manipulation, most persons will be enabled to render the necessary assistance. The retractor, is, however, liable to cause retching and for this reason it is well to apply cocain to the palate and adjacent parts. A bent brush should also be carried to the posterior surface of the velum in order to render this part insensitive. The same end may be attained by putting into the nostrils a few drops of cocain solution, and then allowing it to run on to the palate by throwing back the head. An even more convenient instrument than Voltolini's is White's self-retaining palate hook, introduced to the notice of the profession in this country by Cresswell Baber. It is composed of stout wire, and is fixed in position by a sliding clip, which is adjusted to the upper lip, and which can be fixed in any desired position by means of a screw. Baber has more recently pointed out that by applying White's retractor somewhat loosely and then tilting back the patient's head, and finally depressing the anterior end of the palate hook, the posterior wall of the naso-pharnyx is brought into view. In using these palate retractors the operator should apply firm pressure at once in order to overcome muscular resistance, and, as a rule, he will find it well tolerated. Of course in extremely nervous persons and young children, this method of examination is not practicable. The chief advantage in using a retractor lies in the fact that the introduction of a large mirror is thus rendered possible, and the necessity for constructing a mental picture of the whole by putting together the parts viewed in the small mirror, is obviated.[1]

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[1] Voltolini also sometimes employed a second mirror to bring into view such parts as the extreme upper and posterior part of the naso-pharynx (in which case he used a mirror with a bent handle as a retractor), and the upper surface of the palate. Possibly the same end may be attained by examining the patient with the head hanging over a table or couch, as recommended by Dorn.

Retractors—especially the self-retaining variety—are also useful when operations under guidance of the mirror have to be undertaken. In cases, too, where the palate lies so close to the posterior pharyngeal wall as to render the introduction of even a small mirror impossible, these instruments enable an examination to be carried out. At the same time I do not recommend the routine use of a retractor, as the manipulation is, no doubt, somewhat disagreeable to the patient.

PALPATION.

In many cases palpation is a necessary adjunct of inspection. In the anterior nares a delicate surgical probe, bent near the distal extremity, is employed. This is introduced through the speculum and employed to determine such points as the consistence or attachment of tumours, the presence of dead bone or a foreign body. It is also important to note whether, when the various parts, especially the inferior turbinated bodies, are touched, any abnormal reflex results are produced, such as cough, supra-orbital neuralgia, and other symptoms to which I shall again refer.

A probe may also be employed in the posterior nares, in which case the corresponding instrument, as employed in the larynx, may be used; the curve must then, however, be adapted to the part of the naso-pharynx it is desired to touch. The patient takes charge of the tongue depressor while the surgeon works with the mirror in his left and the probe in his right hand. Palpation with the finger is, however, more satisfactory as a means of diagnosis, it must be admitted, although unpleasant for the patient. The latter is seated while the surgeon stands on his right side, and passes the left arm round the back of his head, resting the hand on the cheek, and pressing its tissues between the molars when the mouth has been opened. I may mention that this pressure is only unpleasant if it be attempted to close the mouth upon the operator's finger, and I have learned by somewhat painful experience to guard against this mishap. Another alternative is to use one of the various guards which have been suggested, for the examining finger, but these more or less hamper its free movement. The index finger of the right hand is now introduced into the mouth, slipped round the palate, and pushed onwards to the septum. When this point has been once reached the two choanæ—a name applied to the posterior nasal orifices as a whole—can be examined. If now the finger be drawn back from the upper part of the septum, the vault of the naso-pharynx can be felt, while the Eustachian orifices are explored by a lateral movement. It is important to bear in mind that each is surrounded behind, above, and to a certain extent in front by an elevated ridge of cartilage, and further that the size of the prominence so formed varies in different individuals. If this fact be not kept in view the Eustachian orifices may be mistaken for tumours. Skill in diagnosing the condition of the naso-pharynx by digital exploration can only be acquired by constant practice.

AUSCULTATION AND PERCUSSION.

In one sense auscultation often gives valuable information as to the existence of nasal disease. By the sense of hearing, the surgeon is enabled to detect the nasal speech in stenosis, and the characteristic sniffling of a patient suffering from the presence of a moveable tumour (*e.g.*, mucous polypus). Snoring during sleep is usual in those whose noses are blocked. Auscultation proper, however, is of comparatively little value. It has been attempted to utilise this method of examination in cases of fluid accumulations in the antrum of Highmore, while the patient holds his nose and attempts forcible expiration. Percussion over this cavity has also been advocated among modern rhinologists, especially by Michelson.

EXAMINATION BY THE SENSE OF SMELL.

Certain nasal diseases—especially ozæna or atrophic catarrh—are attended by fœtor of the air expired through the nose, and considerable information can often be derived by the experienced rhinologist who calls to his aid the olfactory sense. Thus in ozæna the odour is more or less characteristic, while in certain syphilitic ulcerations the condition, although it cannot be diagnosed, may yet be suspected from the odour. It would, however, be useless to attempt to convey an idea of these qualities by description alone.

CHAPTER II.

GENERAL SEMEIOLOGY.

THE symptoms of nasal affections vary, as a matter of course, according to the form of disease present.

Nasal obstruction is perhaps the most common complaint of those who consult the rhinologist, and whether this be due to thickening of the intranasal structures, tumour formation, or some other cause, the symptoms are more or less similar. As a rule, if stenosis be not complete, the obstruction is liable to sudden, and sometimes to the patient, unaccountable variations—an apparent anomaly which is, however, readily explained by a reference to what has before been stated as to the erectile nature of the tissue situated between the mucosa and inferior turbinated bone.

In chronic catarrhal conditions, and more especially in the case of polypi, such variations are also frequently dependent upon atmospheric conditions — the obstruction being more marked in damp weather. If the nasal passages be blocked, respiration must take place through the mouth, and the air so inhaled loses accordingly in warmth and moisture. Besides contributing warmth and moisture to the air as it passes through the nostrils, the nose also acts as a filter, keeping back dust particles which would otherwise enter the lower air passages; therefore, in stenosis the air which reaches the lungs is less pure. In adults, the amount of discomfort caused by inability to breathe freely through the nose is very various. In some persons intense discomfort is produced, while others are scarcely inconvenienced. So far as I have been able to observe, this variation is dependent on whether the patient be neurotic or the reverse. In young infants, obstruction of the nostrils often gives rise to very grave symptoms. It prevents the act of sucking, and deprives them of their natural nourishment, while they are often unable to breathe through the mouth when sleeping, and so rest is lost. In such cases it may be necessary to pass small tubes through the nose to obviate the serious consequences just mentioned.

It is customary to ascribe *deformities of the thorax* to nasal obstruction in childhood, and that such a result may ensue I do not wish to deny. Negation is always difficult in any medical question, and usually unscientific. At the same time I do not think that affections of the nose in childhood often produce pigeon-breast; and I have certainly seen adults whose size, shape, and powers of endurance, were perfect, and who had suffered from more or less impeded nasal respiration all their lives. Recently Guye has described as *aprosexia* the want of power of mental application often observable in children whose nasal respiration is impeded. This author inclines to ascribe the symptom in question to interference with the lymphatic circulation of the brain which communicates with that of the nose. *Frontal pain*, and a feeling of weight in this region, too, are by no means uncommon as a direct result of nasal stenosis, and have been experienced by most persons when suffering from cold in the head. The explanation of these symptoms in many instances is, that the orifice of communication between the nose and frontal sinus becomes blocked, so that the air in the latter is absorbed, and the pressure of the atmosphere from without is painfully felt.

Loss of smell, or diminution of this sense, is a common symptom of nasal disease. In certain cases of stenosis it exists, because the obstruction prevents the odoriferous particles from reaching the olfactory region, situated, as it is, above the middle turbinated body. Anosmia may, however, be due to atrophic catarrh, it may result from a central lesion, and further, it may be caused by localised changes in the middle turbinated body. From my own experience I am inclined to think that blocking of the anterior portion of the olfactory cleft is not uncommonly associated with very marked disturbance of the olfactory sense. If smell be entirely lost for a lengthened period, whatever the original cause, and even when this has been removed, the impairment is likely to be permanent. Zwaardemaker has recently introduced a special instrument (olfactometer) for measuring the power of smell in any given case, but for all practical purposes testing each nostril with odorous liquids or solids is sufficient. The observer must, however, distinguish between smell and common sensation, and therefore it is well not to use unduly pungent substances like ammonia. When the sense of smell is in abeyance taste is also to some extent impaired, because what is commonly called taste actually depends in part upon perceptions by the olfactory nerve. Sweet, salt, acid, and bitter substances, when placed upon the tongue, are recognised, while the bouquet of wine or the flavour of a savoury dish is often lost.

In many cases of nasal disease *the voice* has that peculiar quality spoken of as "nasal." As Schech points out, this may be due either to obstruction to the egress of air (hypertrophies, tumours, etc.), or to escape of air through a perforated palate. The *expression* of a patient with very marked nasal stenosis is usually striking. The mouth is open, the nostrils often narrow, and the lower jaw tends to hang down. This gives rise to an appearance which is often spoken of by surgeons as "strumous looking," and I do not wish to deny that it may show, and indeed does show, an unhealthy condition. In most of these cases, however, when the patients are children, adenoid vegetations in the naso-pharynx are the immediate cause of the facial peculiarity. *Impairment of hearing* frequently exists in conjunction with nasal disease, and middle ear catarrh is often directly due to it. There are physical reasons why, *a priori*, one would expect exhaustion of the air within the tympanum, with all its resulting evils, from obstruction of the nostrils alone. As a matter of clinical observation, however, it has been my experience that ear troubles follow naso-pharyngeal affections; and as a rule, if the anterior nares give rise to aural affections, they do so by producing, in the first place, naso-pharyngeal catarrh. It must have been a matter of astonishment to most of those who have begun the study of ear disease, with the ideas commonly held as to the association of the nasal passages (using the term nasal passage as synonymous with meatus) with aural maladies, to see what a comparative immunity from deafness patients with mucous polypi of the nose seem to enjoy. I shall return to this subject in the section of this work devoted to ear disease, so shall not pursue the matter further here.

Anomalies of secretion are often complained of. As a rule, excessive flow of serum or mucus is present, and it is very rarely that the rhinologist meets with a complaint of diminished secretion. In ozæna the exuded material tends to dry up and gives rise to the formation of fœtid crusts. When excessive secretion is one of the leading symptoms it is important to ascertain whether both nostrils are equally affected, whether the discharge is fœtid or has a purulent character (as in ulceration, caries, impacted foreign body, empyema of the accessory cavities), and whether the amount varies according to the position of the patient.

Severe local pain and fever are comparatively rare in nasal affections, although, as we have seen, frontal headache is not uncommon.

REMOTE EFFECTS OF NASAL DISEASE, WITH SPECIAL REFERENCE TO NASAL REFLEX NEUROSES.

There can be no doubt that at present there is an undue tendency on the part of specialists to seek in the nose the starting point of various evils. Yet it cannot be denied that even this position is preferable to stolid immovable scepticism.

Voltolini was the first author to draw the attention of the profession to the fact that nasal polypi are often the cause of asthma, although, according to J. N. Mackenzie, the association of nasal disease and asthma was previously referred to by Aurelian, Zecchius, Frank, Bree, Forbes, Trousseau, and Duplay. B. Fränkel and Schäffer so far extended this observation in that they pointed out that the same neurosis might be due to hypertrophic catarrh. The close connection between not only asthma, but numerous other neuroses, and the nose, was, however, emphasised by the late Professor Hack in a monograph, which was at first received with considerable scepticism. Gradually, however, the main contention of the work, that many cases of megrim, asthma, nightmare, nervous cough, supra-orbital neuralgia, swelling of the face, vertigo, and epilepsy, are more or less intimately associated with the condition of the nose, is beginning to be recognised. Hack also believed that flickering scotoma, and even organic changes in the optic disc, might result from nasal disease, and he was not disinclined to think that certain cases of joint affection were due to a like cause. In reviewing Hack's work in the light of recent experience, we must conclude that, while he was perhaps too enthusiastic, and while we now know that in his early work he attached too much importance to the erectile tissue of the inferior turbinated body (an error which he himself admitted before his death), yet the correctness of many of his main conclusions have been proved. Sommerbrodt not only confirmed Hack's statements in many respects, but also pointed out that vaso-dilator changes in the bronchial mucosa, chilling of the surface, and weakened action of the heart, may be relieved by treatment directed to the interior of the nose. Heryng further added to the list of nasal neuroses by detailing cases of respiratory and phonatory spasm cured by treatment of the nasal mucosa. This author also seeks to bring certain cases of functional aphonia into the same category of nasal reflex neuroses; but, as the experienced reader knows, any shock may cure this condition, whether the therapeutic agent be applied within the nose or not. E. Fränkel, Thrasher, and Schech have observed cases of excessive salivation dependent upon abnormal conditions of the nose. According to Schech, pain of a neuralgic character affecting the upper arm, the sternum, and the interscapular region, may also result from the same cause.

Blepharospasm and twitching of the facial muscles have been treated successfully by measures directed to the nose. B. Fränkel, among others, records such a case. According to Von Stein functional affections of the heart (palpitation, pain, etc.) may exist as nasal reflex neuroses; while, still more recently, Joal has recorded examples of œsophageal spasm cured by nasal surgery. Hack described a case of Basedow's disease much relieved by cauterisation of the nasal mucosa, and a similar instance has been recorded by B. Fränkel. I have at present under observation a case of this affection without goitre (*i.e.*, exophthalmos and tachycardia only), in which the prominence of the eyes and the general symptoms have distinctly diminished as a result of touching the healthy nasal mucosa with the electric cautery. Semon, on the other hand, has observed a case in which removal of nasal polypi was followed by exophthalmos, without, however, enlargement of the thyroid, or rapid action of the heart; while Réthi has recorded cases in which the employment of the electric cautery for the cure of hypertrophic catarrh produced vertigo, laryngeal spasm, and supra-orbital neuralgia. Recent observations seem to point to a connection between certain affections of the eye and morbid conditions of the nose. The ocular troubles which have been ascribed to this cause are epiphora, conjunctivitis, mucocele, abscess of the lachrymal sac, granular lids, muscular asthenopia, contraction of the field of vision, glaucoma, mydriasis, and atrophy of the optic nerve. It is probable that the connection between these conditions and morbid states of the nose, when it exists, is more directly mechanical than nervous. The same may be said of redness of the tip of the nose, which has been spoken of by many writers as a nasal reflex. My experience has been that, in such cases, the middle turbinated bodies are usually enlarged anteriorly, so as to grasp the septum and interfere with circulation, my observations thus agreeing with the views previously expressed by Bresgen. Hay fever and allied conditions, excepting when complicated with asthma, should not, in my opinion, be classed among nasal reflex neuroses. Nocturnal incontinence of urine in children has, in some instances, been traced to nasal stenosis by Ziem, Major, and Bloch. Farquhar Matheson in Britain, and Winkler in Germany, have drawn attention to the co-existence of stammering with nasal disease as effect and cause.

In deciding whether a neurosis is due to nasal irritation, or whether applications to the nose will relieve it, we are beset with difficulties. According to Hack a neurosis of nasal origin is usually associated with transitory obstruction, coryza, and sneezing. Other authors trust to abortion of the neurotic paroxysm by the application of cocain to the nose as a diagnostic symptom. If the mucosa of the nose be touched at different points with a probe, and a spot be found, irritation of which produces the neurosis in question, this indication is clear. By some writers great stress is laid upon the co-existence of nasal disease; but the information so obtained is open to a very grave objection. While we, as rhinologists, know what a normal nose ought to be, we are not aware of the exact amount of deviation from the normal which may exist without discomfort in any given case. Thus, I venture to say that if a hundred persons, who complain of no discomfort referable to the nasal passages, were examined, abnormalities would be detected in a very large proportion. More or less hypertrophy of the mucous membrane and irregularities of the septum can—while men are constituted as they are, and not according to what the rhinologist conceives they ought to be—hardly be classed as morbid conditions. My own practice is to consider and treat such conditions only when they produce discomfort. I must here add that I do not consider because a neurosis has been cured or temporarily relieved by treatment directed to the nose that it is, therefore, of nasal origin. That irritation of the nose may produce the neuroses we have discussed, or a number of them, is certain. This very statement means—when reduced to physiological language—that a stimulus travels from the nose to a nervous centre; when it reaches this central area it produces a change—whether molecular or circulatory is immaterial; the change in the centre so produced manifests itself as the reflex neurosis. In other words, irritation of the nose may change a nervous centre from stability to instability. Is there any valid reason why the converse should not take place? Is it not probable that, given an unstable nerve centre, irritation of the nose may render it stable? I believe that in quite a number of cases the application of the electric cautery to the nasal mucosa cures a neurosis by acting as a counter-irritant in the sense just indicated. In support of this view I may mention that some years ago I discovered that supra-orbital neuralgia is sometimes relieved by taking snuff, and mentioned the fact to Dr. Brakenridge, who has since found that snuff, mixed with a little pepper, is often very efficacious. More recently Dr. Leslie pointed out that headache, facial neuralgia, toothache, and even asthma, are often—if not always—immediately relieved by the insufflation of common salt into the nostrils. In one of the most obstinate cases of nervous cough I ever witnessed, the only remedy which gave relief was snuff—not employed at my suggestion. As pointed out by Dr. G. A. Gibson, the ancient Greeks (Hippocrates, Plato) were well aware that obstinate hiccup is curable by tickling the nasal mucous membrane, even if the titillation be not carried so far as to cause sneezing. The application of the cautery to the back of the neck has been known to cure paroxysmal cough and supra-orbital neuralgia; but we are not, therefore, entitled to say that in these instances the neurosis had its origin in this region. A number of examples might be adduced, but, not to multiply instances needlessly, I shall only refer to cauterisation of the lobule of the ear, which was an old-fashioned cure for sciatica. This long disquisition would be unjustifiable did it not lead up to a clinical point of importance. It seems to me that if my point has been in any degree proved, the necessary deduction is that counter-irritation of the nose may be useful treatment in these neuroses which are proved to be frequently associated with nasal disease, even when the nostrils are healthy. This is the view I expressed in 1887, and I have been still further confirmed in it by Dr. Leslie's success in treating certain neuroses with insufflations of salt.

Let us now select from among the neuroses which we have mentioned as associated with nasal disease those which are more commonly met with. Asthma should, I think, be placed first on the list. This association of asthma with nasal disease is sometimes very remarkable. In the case of nasal polypi I have seen the removal of a small growth, not materially interfering with respiration, produce an immediate improvement, remarked by the patient almost before the snare had left the nose. If asked how cases of asthma suitable for intranasal treatment are to be selected, I should reply that success is more probable in cases where touching any part of the nasal mucosa with a probe produces cough, instead of the normal nasal reflex, sneezing.

It has been asserted by J. N. Mackenzie that irritation of the posterior end of the inferior turbinated body commonly produces cough; but this I have not been able to verify. Under certain circumstances, however, any part of the mucosa may respond in this way to a stimulus, *e.g.*, the anterior extremity of the inferior turbinated, the middle turbinated, and the septum. In one of my cases, where the electric cautery was being applied to the septum during chloroform anæsthesia, this phenomenon was very marked, even when the patient was entirely under the influence of the anæsthetic. In all such instances it is quite obvious that a co-existing nervous cough, whether associated with asthma or not, is likely to be relieved by treatment of the sensitive area.

Supra-orbital and occipital neuralgia may be associated with the nasal cavities; but even when this is the case, it has been rare, in my experience, to find any intranasal area which, when touched, produced marked exacerbations. At the same time, I have seen a number of such cases relieved by intranasal treatment. Nightmare, too, in children is often associated with nasal stenosis; but I think that this is due more to mechanical than to directly nervous influences.

True megrim and epilepsy I have not so far met with in direct connection with nasal disease. I have, however, seen attacks of epilepsy occur for the first time during the passage of a Eustachian catheter.

As to the *prognosis* of cases in which an attempt is about to be made to treat the neuroses mentioned by local remedies, I do not think too much care can be exercised. The greatest probability of success is in cases of asthma and nervous cough, in which cough can be produced by touching the mucosa of the nose; but even when temporary relief, or even apparent cure, results, the neurosis is liable to return.

This is not the place to discuss *treatment*, but it is impossible to avoid a few remarks on the subject. When well-defined nasal disease exists, it should, of course, be treated on its own merits. In the many cases, however, in which slight hypertrophy exists —not sufficient of itself to demand interference—I would suggest the following rules for guidance:—

(1) Try to eliminate every other possible cause of nervous irritability.

(2) If the neurosis can be produced by touching any special point of the mucosa, or if, in a case of asthma, cough be so produced, apply chromic acid or the electric cautery to this area.

(3) If no such area exists, apply the caustic to the anterior extremity of the inferior turbinated body.

Subsequent observation will show how much value is to be attached to the insufflation of salt as a means of treatment in these neuroses. Applications of menthol have also been recommended, and reference has already been made to cocain.

Before leaving this subject, it may not be out of place to add a further word of warning against operating on the nose, with the idea that if it does not cure the neurosis this method of treatment can do no harm. The experiences of Semon and Réthi, already referred to, indicate how erroneous is such a view. Still more recently Chapell has shown that intranasal surgery is sometimes responsible for very grave nervous symptoms—such as incapacity for mental effort, which may last long after all evidence of the lesion which caused it has disappeared.

CHAPTER III.

GENERAL THERAPEUTICS.

Fluid Remedies.

Applied in Quantity.—Liquids may be employed for the medication of the nasal cavities by various methods.

It is not desirable to make the patient draw up the remedy by sniffing, as this is alike uncomfortable at the time and likely to be followed by frontal headache. If simplicity be desired, then the medicated fluid is held in the palm of the hand and drawn into the nose while the head is thrown back; in this way the olfactory region proper, which does not usually require treatment, commonly escapes from contact with the liquid. A similar effect is obtained by pouring the solution into the nostrils, while the head is thrown back, either with a teaspoon or one of the numerous apparatus devised for this purpose. In many cases, however, it is desirable to run a current from one nostril to the other, so that on its way the irrigation may take effect upon the naso-pharynx. When liquid is injected into either nostril, the palate at once rises so as to shut off the naso-pharynx from the pharynx, and thus the stream is directed out of the opposite nostril. During the process, however, it is of great consequence that the patient should not either attempt to swallow or to speak, lest these acts should open the Eustachian tubes, and so admit the liquid to the tympanic cavities. For the same reason, care should be taken that the fluid be not injected with too great force, and the stream should be checked if any discomfort is experienced in the ears. Further, if one nostril be more obstructed than the other, the former should always be chosen for the insertion of the nozzle of whatever apparatus is employed. The stream itself is directed backwards and only slightly upwards, while the patient breathes through the mouth. In simple cases, a small indiarubber ball syringe is sufficient, but if more pressure be desired, the nasal douche should be employed. An apparatus made after the model of the common enema syringe may also be used for the purpose. Great care should always be taken to avoid excessive pressure. If, unfortunately, the fluid has entered the Eustachian tubes, the patient should hold the nose, make pressure on the tragus, and swallow repeatedly: by this manœuvre the occurrence of middle ear inflammation, which is so liable to supervene upon the entrance of fluid, may often be prevented. In my experience, it is very rarely required to employ—that is, in considerable quantities—liquids with the object of confining their action to the naso-pharynx. This can be done by some persons as a modification of the act of gargling, performed by suddenly throwing the head forward and shutting the mouth. Many authorities recommend bent syringes and sprays which are passed behind the palate, while the late Von Tröltsch employed a tube which he introduced through the nostrils into the naso-pharynx and which had at its extremity a number of perforations.

When large quantities of fluid are employed, as in the methods just discussed, the solutions must be weak. If the object be simply to clear the passages and naso-pharynx of inspissated pus or mucus, a solution of common salt (ʒi. to a pint) is very effective and devoid of irritating qualities. Bicarbonate of sodium, chloride of ammonium, or borax may be used in the same strength. Harnack claims that lime water acts not only as a solvent of mucus, but also as an astringent; if used as a nasal douche, however, this remedy must be diluted, at all events in the first instance, and strengthened according to individual toleration. Alkaline and sulphurous mineral waters are often recommended, more especially in Spas, and no doubt they act favourably in many instances, just as a solution of common salt often does, on account of their cleansing properties.

Actual astringents should be used with care, even with a small syringe, and I think it is of questionable propriety to employ them at all when the fluid is injected in very large quantities by means of the douche. Sulphate of zinc and alum solutions have in this way caused loss of smell. Probably the safest remedy of this class is tannic acid; and even that should not, in my opinion, be employed in any but weak solutions.

Antiseptic remedies are very frequently required in the treatment of nasal disease, and when they are indicated, it is commonly desirable to employ the douche. Carbolic acid has been known to damage the sense of smell, therefore it is well to avoid this drug. As solutions suitable for douching, the following may be mentioned, viz., permanganate of potassium (30 minims of the B. P. solution to a pint), chlorate of potassium (ʒi. to a pint), boracic acid (ʒi.-ʒiii. to a pint), tar water, and acetotartrate of aluminium (ʒi. or more of a 50 p. c. solution to a pint, according to toleration). The last-mentioned remedy is antiseptic, astringent, and slightly caustic in its action, and therefore very serviceable in ozæna.

Writing both as an aurist and rhinologist, I cannot but think that the danger to the middle ear from the employment of the nasal douche has been somewhat over-estimated. If only the precautions already mentioned be enjoined, and if, in addition, the patient be directed not to clear the nose by *blowing during compression of the nostrils* for half an hour after the use of douche or syringe, cases of otitis resulting from nasal medication will rarely occur. At the same time the employment of the douche is often abused, inasmuch as some practitioners act on the principle of recommending it for every case, regardless of the condition actually present. The douche ought not to be used unless there be tough secretion or crusts to be removed. In catarrhal cases, where alkaline injections are indicated, the small indiarubber syringe usually serves every purpose required. As to astringent remedies used in this way, I cannot help believing that the more thoroughly aurists and others understand the rational treatment of nasal disease, the less will this class of therapeutic agents be thus employed. Some authorities lay great stress upon the temperature of the fluid employed for nasal injections and douches. In most cases, water which has been for sometime in a warm room may be employed; if however, the patient finds it grateful, there is no objection to employing it at a temperature of 90°. As a rule, a pint of fluid is sufficient for each *séance* when the douche is used, while a few syringefuls will suffice when this apparatus is employed.

Sprays.—A very powerful spray, such as that recommended by Morell Mackenzie,[1] is very serviceable for the purpose of cleansing the anterior nares. Indeed the inferior, and especially the middle meatus, can be cleansed perhaps more effectually and safely by this means than with the douche or syringe. As the quantity of fluid used is small, carbolic acid may be safely employed. The solution I commonly prescribe contains 10 grs. of bicarbonate of sodium and borax, and 1 gr. of carbolic acid to the ounce of water. A comparatively strong solution of tannin may also be used (gr. v.-vii. ad ℥i.) if an astringent be required. Rectified spirit—as first suggested by Mr. Miller of Edinburgh—is very valuable as a spray in cases of small nasal polypi, and to prevent recurrence of large ones. The same remedy is also used by Cresswell Baber in hypertrophic catarrh. This drug is a powerful astringent, alike coagulating albumen and abstracting moisture. In prescribing it I generally direct that it should be employed diluted at first (1-5 of water), and gradually concentrated as tolerance is established. As a matter of experience, the undiluted spirit can generally be used without appreciable discomfort after from four to six applications. When giving directions as to the employment of the spray, it is advisable to direct the patient to breathe through the mouth, and to keep the eyes shut as the spray is removed. Rumbold and Ruault suggest the employment of fluid vaseline sprays in nasal disease, and both authors are enabled to record most satisfactory results from this method, which, however, requires the use of instruments specially constructed for the purpose. Ruault's and the De Vilbiss spray are both useful for spraying oleaginous substances into the nares.

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[1] Known as "the anterior nasal spray."

Applications made with Brush or Cotton Wool.—When it is desired to apply strong solutions, this is best effected by means of a camel's hair brush or cotton wool, attached to a specially-constructed instrument, *i.e.*, a roughened probe or small forceps for the anterior nares, or suitably curved forceps for the naso-pharynx. As a matter of fact concentrated solutions are rarely employed in this way for the anterior nasal passages. In making applications to the naso-pharynx a laryngeal brush, with a length of curve adapted to the capacity of this region in the individual case, is the most efficient instrument for the purpose. Any of the applications discussed in connection with laryngeal disease may be employed.

MEDICATED VAPOURS.

What has been said as to volatile substances and steam inhalations in the section on laryngeal therapeutics applies with equal force to nasal disease. Creasote inhalations have a very limited value in cases of ozæna, and they are, perhaps, the most useful of this class of remedies. Chloride of ammonium inhalations are, however, very valuable in certain cases of nasal disease, and if Godfrey's apparatus be employed some volatile agent may be used at the same time.

MEDICATED POWDERS.

These are applied by means of insufflators, which must be straight for the anterior nares, and curved when it is desired to medicate the naso-pharynx. For the latter region the apparatus employed for the larynx is serviceable. The powders so employed are usually either more or less caustic and astringent or antiseptic. To the first class belongs nitrate of silver mixed with starch. Bresgen recommends that very diluted applications of this drug should be made in the first instance (1 in 200), and then strengthened according to toleration up to 1 in 10. Acetotartarate of aluminium is astringent, caustic, and antiseptic in its action. Moldenhauer seems to employ this substance as an insufflation without dilution. According to Schäffer, who introduced both remedies, the aceto-glycerate is more adapted for this purpose, as its action is less energetic, while its properties are the same. Morell Mackenzie recommends powdered eucalyptus (1 part to 2 of starch), persulphate of iron (1 to 3 of starch), and catechu, as applications to the posterior nares. The antiseptic remedies most employed for insufflation are boracic acid, iodoform, and iodol, while the sozoiodol salts have of late been strongly recommended by Fritsche[1]. He employs the salts of potassium and sodium undiluted, that of zinc (1 in 10, or even 1 in 5, diluted with sugar of milk), and mercurial sozoiodol (1 in 20, up to 1 in 10). Cocain and morphia, diluted with starch, have been employed by insufflation as anæsthetics.

ANÆSTHETICS.

No doubt the best local anæsthetic is cocain, applied as a 20 p. c. solution by means of cotton wool, held with small bent forceps, such as are employed for the ear, if the anterior nares only are to be acted upon, and with a bent brush or cotton holder if it be desired to influence the posterior nares. It must always be remembered that the more firmly—not to say roughly—the application is made the more complete is the result. Before applying the palate hook it is well to put into each nostril a small piece of cotton wool saturated in a solution of cocain, and then to squeeze the nose and make the patient throw his head back; in this way the posterior surface of the soft palate is readily anæsthetised. It is worthy of note that in those who have habitually applied this drug to the nasal mucosa, its anæsthetic effect becomes to some extent lost. In such cases a solution of menthol (50 p. c. in olive oil) may be tried as a substitute according to Rosenberg's suggestion. It is, however, far inferior to cocain in its action, and much more disagreeable to the patient.

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[1] According to this author these may be employed as laryngeal insufflations.

CAUSTICS.

The only destructive agents of this class which I frequently employ are chromic acid and the electric cautery; of trichloroacetic acid, concerning which the experiences of different observers seems to have varied so much, I have no clinical knowledge. Chromic acid is used as a bead fused upon a silver probe, as described in the section devoted to the pharynx. Should violent pain follow the application, a little bicarbonate of sodium solution should be used to neutralise the caustic, while, if the acid finds its way into the mouth, a little of the same fluid may be swallowed. The caustic must not be applied to a large surface at one sitting, lest symptoms of collapse and irritant poisoning, due to absorption, should occur.

The electric cautery is applied as already described. In addition to a flat burner it is well to have one in which the platinum point is spear-shaped. This can be plunged into the erectile tissue of the inferior turbinated body when it is desired to retain the mucosa. It is the common custom to speak of chromic acid and the electric cautery points as quite similar in action. To a great extent this is true, but in cases of hypertrophic nasal catarrh I always prefer to use chromic acid when the patient complains of discharge from the nose as one of the chief discomforts. In other words the electric cautery is the most rapid method of destroying tissue, but if a marked astringent action be also desired, associated with only a moderate destruction of tissue, then I prefer chromic acid. This property of chromic acid cauterisations is probable due to the action of such of the acid as diffuses itself over the whole mucosa. If it be desired to apply the electric cautery to the naso-pharynx, one of the bent instruments contained in Schech's set may be employed. As these instruments are flexible they can be adapted as required for each particular case.

ELECTRICITY.

Electricity when employed to stimulate the return of the sense of smell has not met with much success, partly because it is extremely difficult to reach the olfactory nerve, partly because of the pain produced, and chiefly because of the pathological conditions which are commonly the cause of anosmia. The most recent development in rhinology is the use of the constant current in the treatment of intranasal disease. Thus Bryson Delavan advocates the introduction into the nostril of one electrode, composed of copper wire surrounded by moist cotton wool to which is attached the negative pole of the battery, while the positive electrode, a sponge, is applied to the back of the neck. French authors also have recorded satisfactory results from this method of treatment, which is spoken of by Mendoza as having "a trophic, and modifying action." According to the same authority hypertrophies may be treated by using an electrode composed of a metallic plate kept in close contact with the part upon which it is desired to act, and in this way an eschar may be produced. This is neither more nor less than electrolysis as he points out; the same result can also be attained by connecting a platinum or gold needle plunged into the tissues with the negative pole. Sometimes two needles are used close to one another, and then the destructive action is, of course, more energetic. Miot also has advocated electrolysis in the treatment of deviated septum. When actual destruction of tissue is desired, and when it can safely be accomplished more quickly, and probably, on the whole, with less pain — for electrolysis is by no means painless — I cannot see that it is desirable to employ this more complicated method. In naso-pharyngeal tumours, on the other hand, electrolysis may be most useful. As we shall see in a later chapter some of these growths are prone to bleed even if the galvano-caustic snare be used, but many of them are so situated that a wire cannot be made to encircle them. For introducing electrolysis, as a means of treating such cases, we are indebted to Nélaton, and for its further development to Voltolini and Michel.

Voltolini began his experiments by employing needles, but was dissatisfied with the result, because in one case he had reason to suspect that these instruments had led to meningitis. In order to effect electrolysis with greater safety he introduced an electrolytic snare and forceps. The former has a small piece of ivory let into the wire, and is then employed in the ordinary way with the handle used for the galvano-cautery. The common snare may, however, be utilised if the tubes be carefully coated by an insulating material (*e.g.*, a solution of indiarubber in chloroform). In this case only one pole, usually the negative, is attached to the handle while the other is applied by means of a sponge electrode to the cheek. Electrolytic forceps are so constructed that each blade is connected with a pole of the battery, care being taken that isolation is complete by means of ivory near the distal extremity, and indiarubber coating elsewhere.

Michel employs two needles isolated by indiarubber tubing each of which is connected with a pole of the battery, and both of which are inserted into the tumour. This author emphasises the fact that, after the operation is over, they should be carefully and gently withdrawn—especially that connected with the positive pole—in cases where hæmorrhage is feared.

The electric cautery has already been touched upon. In the removal of tumours a snare heated by electricity is often extremely valuable. The best wire for this purpose is that known as piano wire, but the smallest size is rather too thick to be employed with comfort in Schech's instruments, if great delicacy is required for the manipulation. Thinner steel wire may then be used, but of course the strength of current employed must be regulated to suit the thickness of the material. It must also be remembered that if the object in using the electric cautery be to prevent hæmorrhage, the snare must not be raised to a white heat; at the same time it must not be forgotten that considerably more current will be required to heat the wire when it is embedded in the tissues of a tumour, than previous to introduction. These details can, however, only be mastered by experience. Platinum wire is now rarely employed. In operating on the anterior nares the tubes for the snares are straight; two forms, however, should be at hand, in one of which the tubes are on the same level, while in the other they are one above the other. In operating on the naso-pharynx through the mouth the tubes must be curved, the distance between the beginning of the bend and the extremity being, however, considerably less than in those employed for the larynx.

OTHER OPERATIONS.

As nasal surgery has been lately, and is even yet, passing through a period of spasmodic activity, I shall make no attempt to describe all the various instruments which have been suggested by authors, but confine myself to a brief consideration of those which are sufficient to meet most indications likely to arise. Other apparatus will, when necessary, be mentioned in discussing the special conditions in which their use is indicated.

Forceps.—In order to apply cocain the common ear forceps may be employed, and with them a pledget of cotton wool, saturated with the solution, is applied. Forceps[1] of the same shape, but having teeth at their extremity like the old artery forceps, and with a spring catch to keep them closed, are sometimes useful for holding moveable neoplasms while the snare is being adjusted. Common dressing forceps are often employed in removing foreign bodies from the nose, and formerly the same instrument was much in vogue for operating on nasal polypi. Indeed, by some surgeons, it is still in use for this purpose; but it is now generally admitted that, with rare exceptions, other methods are preferable. Although Stoerk recommends specially constructed forceps, the angle of whose bend can be adjusted at will, for removing post nasal tumours (*i.e.*, polypoid tumours), this class of instrument is rarely employed in the naso-pharynx except for the purpose of removing adenoid vegetations. The form commonly used in this country is Woakes' modification of Löwenberg's forceps. Schech also has constructed an instrument on the same principle, viz., forceps powerful in structure, with the handles bent at an obstuse angle, so that the operator's hand does not conceal the pharynx, while a second bend near the extremity enables the ends, fashioned somewhat after Morell Mackenzie's cutting laryngeal forceps, to be introduced behind the palate. Kuhn's forceps I have also upon occasion found very useful; the extremities are fenestrated, and of such a size that they can grasp a considerably larger piece of tissue than the other instruments just referred to. They are made of two shapes, one adapted for reaching the roof of the naso-pharynx, and the other, with a more obtuse angle, suitable for removing tissue situated in the posterior wall. All these instruments open laterally. Lennox Browne, however, speaks highly of Schutz's antero-posterior forceps in which the blades are fenestrated. It is probable that any one of these instruments will be found effective in practised hands; but I am quite satisfied with the pattern first advocated by Löwenberg and Woakes; although I believe the latter authority has recently introduced a third bend in the instrument.

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[1] I first had these made to extract soft foreign bodies from the ear.

Snares.—As before stated, it is often advisable to employ fine wire when operating with the electric cautery. If cold snares be employed, the thickness of the wire should be regulated by the probable amount of resistance, as estimated after examination of the mass to be removed. Piano wire is very serviceable, and should, if practicable, be used, as its resilience is such that, after passing a constricted part where the loop is compressed, the snare tends to resume its original shape. When only a small and soft polypus is to be removed, the electric cautery snare may be used without turning on the current—in fact, as a cold snare. It is well, however, to have another and stronger instrument for the purpose. The cold snare I generally use is a simple, straight, and strong metal shaft, so constructed that the wire does not slide in a tube, but lies visible along the instrument. The chief advantage of this arrangement rests in the fact that it can be quickly threaded, which is certainly not the case with those instruments in which the wire has to be passed along a narrow tube which is likely to become constantly blocked. In my instrument, the wire is attached to a sliding bar. I must here say a word as to the use of piano wire; owing to its resilience, it will be found to be impossible to wind it round anything and retain it in position. By simply heating the extremities, however, they become soft and flexible. In using a snare, it is of the utmost consequence to see that the loop of wire is not too long, otherwise it cannot be made to cut its way home. If a bent instrument be preferred, I should recommend an ordinary Wilde's aural polypus snare made on a larger scale.

Any of these can be converted into écraseurs by making the bar to which the wire is attached slide on a screw, and having a nut underneath. I have found such an arrangement most useful, as the snare can be employed either as an écraseur or not at will.

A very delicate, but at the same time strong nasal écraseur is that known as Jarvis's. It is so made that two extremities can be fitted to the same shaft; one of these is straight, adapted for work in the anterior nares, and the other bent and suited for the naso-pharynx. The only drawback is, that the tube in which the wire runs is extremely prone to rust, and thus make threading impossible.

In using snares for the anterior nares, the wire is simply passed under (very rarely are tumours so situated as to require it to be passed over) the tumour, and pushed up as far as possible. In the case of pear-shaped growths, and when dangerous hæmorrhage is not likely, it is preferable, after closing the snare sufficiently to grasp the tumour, to employ it for evulsion. Indeed, it may be stated as a broad rule, that the cold snare should always be employed in this way, as when cutting is intended, the wire acts better when heated by electricity.

In order to encircle naso-pharyngeal tumours, one of two methods may be adopted. A bent snare may be used and guided over the growth with the aid of the mirror, a proceeding which is much assisted by the employment of a palate retractor; or the snare may be passed through the anterior nares. In either case an assistant is necessary, and, if the second plan be adopted, success will be much facilitated by employing the straight snare[1] as follows:—The snare is threaded with piano wire, which is pulled in so as to leave only a very small loop. The instrument is then passed along the septum with one tube over the other, so that the diameter of the loop lies along the septum. In this way the extremity is made to pass into the naso-pharynx; then the instrument is turned so that the diameter of the loop is parallel to the soft palate, towards which the free end of the growth is usually directed. By paying out wire the snare can now be increased to any desired size owing to the resilience of the wire. The assistant now passes his two index fingers into the naso-pharynx, and pushes the loop over the tumour, while at the same moment the operator tightens the snare.

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[1] The electric cautery is generally most suitable, because a more delicate instrument can be employed, and because its use is less likely to be followed by bleeding.

Cutting Instruments. — It is rarely necessary to use the knife within the nasal cavities. For operations on osseous or cartilaginous outgrowths small saws may be employed. Probably the most serviceable instruments of this class are those known as Bosworth's, in which a small saw is attached to a wooden shaft at an obtuse angle. It is better to have two of these, in one of which the serrated margin is directed downwards, and in the other upwards.[1] Some authorities use gouges and chisels driven home by a wooden mallet for the same purpose.

Scraping Instruments.—It has been recommended to operate upon adenoid vegetations of the naso-pharynx with the finger nail, but I am of opinion that this method is rarely satisfactory in well marked cases. Quite a number of instruments, in which a metal finger guard is armed with a scraping apparatus, have been advocated for the same purpose. Sharp spoons are employed by Justi and Trautmann, while Lange and Hartmann advocate curettes which cut from side to side.

By far the best instrument is, in my opinion, Gottstein's, which is a triangular steel frame, adapted to a handle at a suitable curve. The extremity of the instrument forms, at the same time, the base of the triangle, and its inner (*i.e.*, proximal) edge is sharp. When in position for beginning the operation the blunt margin lies nearly in contact with the septum, and the whole triangle rests against the vault of the pharynx, so that any redundant tissue can be made to enter the open space by exercising pressure upwards and backwards. When the instrument is withdrawn, while such pressure is kept up, the knife comes into contact with the opposing structures, and cuts them off. Small sharp spoons are recommended by some authors for scraping away diseased bone, while Schäffer employs a delicate, but strong, instrument of this kind for opening the sphenoidal sinus, which is reached by passing the spoon straight back at a level with the free margin of the middle turbinated body.

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[1] Roe has constructed an ingenious apparatus in which the saw is worked by electric power, the advantage claimed being increased rapidity.

Instruments for the Arrest of Bleeding.—Bellocq's sound is usually mentioned in all works on nasal disease, but, so far as I know, it is rarely used; indeed, most of the instruments made would not, without undue violence, pass through any ordinary nose. If it be desired to plug the posterior nares a small-sized, soft rubber catheter is the best instrument to employ. To its extremity is attached a piece of string of sufficient length. The point is now passed into the nostril, while the patient sits, with open mouth and light thrown on the pharynx, before the surgeon. When the latter sees the catheter appear below the palate he seizes it with dressing forceps, and pulls it and the attached string out through the mouth. A pledget of lint—preferably saturated with vaseline, to which some antiseptic has been added, if there be a prospect of the plug having to remain *in situ* for any length of time—is now attached to the string about 18 inches from its extremity, and pulled up behind the palate, after which the two projecting strings are tied together. It is often useful, at this juncture, to introduce the finger to guide the pledget past the uvula and soft palate. If it be only desired to plug the anterior nares, a long strip of lint—saturated with vaseline to prevent sticking—is pushed in by dressing forceps. Plugs produced by distending membranous or indiarubber bags, with air or fluid, have been employed, but they seem to be only complicated methods of arriving at a simple result.

Other Instruments.—In some cases it is desirable to snare off pieces of hypertrophied mucous membrane. In order to enable the wire to engage in the tissues it is sometimes necessary to transfix the portion to be operated upon with a curved needle.

In removing osseous and cartilaginous hypertrophies certain

American authorities (*e.g.*, Goodwillie, Clinton Wagner) advocate the employment of the dental engine worked by the foot. To this are attached such instruments as revolving knives, saws, and burrs. If electricity be employed as the motive force, increased velocity can, of course, be obtained.

In the after treatment of operations on the nose some little care is requisite. If there be much bleeding plugging may be necessary, but it is advisable always to saturate the lint used with some oleaginous antiseptic, *e.g.*, menthol in olive oil, which is also anæsthetic, or fluid vaseline with carbolic or boracic acid. Even then the plug should never be left more than twenty-four hours *in situ* if it can be avoided. After operations of any importance the patient should keep quiet, and on no account expose himself to septic influences. It is often desirable to have the nose syringed with boracic lotion, especially when any suppuration has resulted from the operation.

General Hygiene.

What has been said as to the hygiene of the larynx applies generally *mutatis mutandis* to the nose. In catarrhal conditions, chills, bad air, and irritants—whether in the shape of tobacco smoke, snuff, or chemicals,—must be avoided. Chilling of the feet seems to be particularly liable to result in nasal catarrh.

Cold bathing, or if this be not tolerated, sponging with tepid water followed by friction, fresh air, and methodical exercise are of importance. In quite a number of mineral water Spas, patients suffering from nasal catarrhs may receive benefit, owing to the healthy life, regular bathing, and the application of cleansing solutions to the nostrils there enjoined. A dry atmosphere, as free from dust as possible, is that which is most suitable for nasal cases in general, while the victims of hay-fever get most relief at the sea-side or during a voyage. As we shall mention later, internal remedies are often useful adjuncts in treatment, but for chronic cases local remedies are usually of more consequence. There is, however, one condition which should, so far as possible, be combated in all cases of nasal disease, both on general and special grounds. I refer to neurasthenia. In persons suffering from nervous exhaustion, there is a great tendency to erectile swelling of the turbinated bodies, leading to periodic attacks of nasal obstruction, even if no local lesion exists, or intensifying the effect of any existing narrowing of the passages. Owing to the irritability of the nervous system, great distress is thus occasioned, and a vicious cycle tends to become established—the obstruction alike depending upon and keeping up the neurasthenia.

Another important point is the marked sympathy which exists between the genital organs and the erectile tissues of the nose. Indeed, most women who suffer from nasal obstruction, state that it is aggravated during the menstrual periods. In those who suffer from chronic uterine or ovarian diseases the connection is very marked, and, as these patients are usually neurasthenic, often extremely distressing. Nervine and blood tonics, rest, and plentiful diet are therefore frequently indicated, while gynecological treatment may also be required.

CHAPTER IV.

NASAL ORIFICES AND SEPTUM.

CONGENITAL ABNORMALITIES.

IN a practical manual it would serve no good purpose to describe all the various *lusus naturæ* of which the nasal region has been made the arena. From absence of the nose to a reduplication of this organ different stages have been met with. The septum has been found extending backwards so as to divide the naso-pharynx into two cavities.

Of more importance from a clinical point of view, and yet of great rarity, are the following conditions:—(1) atresia of the anterior nares; (2) atresia of the posterior nares. When either of these conditions exist in a new-born child life is threatened, both because the nose is the natural respiratory channel, and because its obstruction prevents sucking. When the obstruction is in front it is easily diagnosed and is usually membranous. When the choanæ are closed posteriorly, the occluding septum may be either membranous, as in a case described by Ronaldson, or osseous. The treatment in either case must be operative. Incision, followed by the introduction of tubes, is indicated when a membrane closes the anterior orifices. When the posterior nares are closed the electric cautery or a trocar may be employed.

ECZEMA.

Eczema not unfrequently attacks the skin just inside of the nostrils. There is usually more or less thickening of the parts, while very commonly the nostril is blocked with crusts. Occasionally the thickened skin presents clefts which are, according to Moldenhauer, a favourite point of entrance for erysipelas poison. Indeed this author goes so far as to say that in most cases of repeated facial erysipelas this condition is found. Moldenhauer, moreover, believes that sycosis—as distinguished from eczema—is not unfrequently met with; in these cases each pustule is seen to be perforated by a hair.

The *treatment* of eczema is usually simple. The general health must be attended to as demanded by therapeutic indications, the crusts are best got rid of by removing them after they have been softened with vaseline. Oxide of zinc or white precipitate ointment may be then applied. Should the affection prove obstinate, however, I believe that no treatment is so likely to prove effective as nitrate of silver applied freely as a solution of from 10-15 grains to an ounce of water or spirits of nitrous ether. In sycosis various methods of treatment are advocated. Moldenhauer cuts the vibrissæ short, only pulling them out when they become loose, and trusts chiefly to cleanliness, puncturing the pustules as they form, and scarification if the skin be much thickened. Others employ local applications of corrosive sublimate solutions (1-1000 or 2000) as recommended by Schmiegelow, or an ointment containing bismuth and white precipitate (āā. 1 to 10 of vaseline).

DEVIATIONS OF THE SEPTUM AND ALLIED CONDITIONS.

That deviations of the septum may be traumatic is a self-evident truism. That they are not due to direct injury, in a very large proportion of cases is, however, the experience of most rhinologists. It is further of interest to observe that, according to the observations of Zuckerkandl, they are rarely met with in persons under seven, and Schech states that malformations of the septum often originate between the ages of fourteen and twenty. The last-named authority gives a very rational explanation of the abnormality in question. The cartilage of the septum is wedged in by bone, and if it should grow more rapidly than other parts, deflection cannot fail to occur. The abnormality is usually confined to the cartilaginous part of the dividing wall, but the osseous portion is occasionally involved as well. Thus arises the so-called S-shaped deviation, in which the septum presents a convex bulging into the anterior part of one nostril and the posterior portion of the other.

The *symptoms* are those of nasal obstruction, often confined to one nostril.

Diagnosis is for the most part easy; the septum presents a convex projection on one side, and if the opposite nostril be examined a corresponding concavity is found. It must be remembered that more or less deflection is frequently met with, and that treatment should only be thought of when marked symptoms result.

The *treatment* of this condition has afforded much scope for the ingenuity of operators. Punching a piece out of the deflected portion is by no means always successful in restoring nasal respiration. Forcible straightening, as recommended by Adams, is often practised. After the parts have been forced into proper position they must be supported by ivory plugs, by lint smeared with vaseline and some antiseptic, or by a specially constructed splint. Dundas Grant has recently introduced an instrument which supplies both of these indications and is highly recommended by Lennox Browne. Again, others recommend incision of the mucosa and perichondrium, which parts are pushed aside by a scraper, followed by removal of so much of the cartilage as is desirable. This operation seems to have been advocated by Chassaignac in 1875, and more recently by Hartmann. In order to accomplish it more thoroughly it has even been suggested to detach the ala of the nose from the face.

If the convexity be very prominent, sawing off a portion with Bosworth's saw, and then plugging with lint saturated in vaseline and olive oil, to which an antiseptic has been added, is a comparatively simple plan of treatment. If only a thin slice be removed a complete perforation is unlikely to persist. Clinton Wagner highly recommends rotating knives worked with the dental engine, while recently Sandmann has advised the use of files for removing the prominent part of the septum. Voltolini has had excellent results in cases where the deviation was confined to the cartilage, from applying the electric cautery to the most projecting point. He did not in this way perforate, but trusted to the traction of cicatrisation to restore the parts to proper position. If several applications of this treatment should be required, the operations must only be repeated at considerable intervals. It is noteworthy that Voltolini, bold operator as he was, advised that, in those cases in which deviations existed in the osseous part of the septum, an attempt should be made to gain breathing space by applying the electric cautery to the inferior turbinated body, and thus to avoid the necessity for more serious operative interference. The most recent treatment advocated by French authorities (Miot, Garel) is electrolysis of the projecting structure, which, in my opinion, must have an action similar to that of the electric cautery. My own experience has been that deviations of the septum are not a very satisfactory class of cases to treat, and unless the nasal obstruction be very marked, the patient, if he be flippantly inclined, is prone to conclude that "the game is not worth the candle."

Cartilaginous, and even osseous, projections into the lumen of the nostrils are by no means uncommon. Thus, it is not rare to find a ridge of bone or cartilage running along the inferior meatus, near the junction of the septum with the floor. Another favourite situation for such projections is the cartilaginous septum, opposite the anterior portion of the inferior turbinated body. Indeed, there is almost no part of the septum and floor of the nostril where they may not be met with.

The *diagnosis* is very simple, as they can be recognised by the probe to be of hard consistence, while their appearance is such as to prevent any chance of their being mistaken for neoplasms. When a projection from the septum is due to an outgrowth there is, of course, no concavity to be found on the opposing nostril, such as is met with in simple deflection.

The *treatment* of these spines and crests has of late been carried to an extreme. They should only be operated upon when causing distinct obstruction or irritation. I always examine the nose in all my private cases of middle ear disease, and the number of examples of such cartilaginous and osseous outgrowths met with in persons who positively assert that they have no discomfort, is astonishing. It is rarely that these abnormalities—if, indeed, what is so common can be called an abnormality—are sufficient in themselves to block the nostrils, so that the actual discomfort is often directly due to thickening over the inferior turbinated body. The last-named condition should, unless in the case of very marked projection from the septum, receive attention first, and further treatment is thus often rendered unnecessary. When required the outgrowths can, however, be removed either with Bosworth's saw, or a gouge and mallet. When the saw is used it is important to attend to the following details:—the instrument, with the serrated surface upwards, should be made to cut the growth half through from below upwards, and afterwards with the second saw the outgrowth is attacked from above, until the wounds are connected. Sandmann suggests the employment of files, and the suggestion is apparently a good one; but as it is quite recent, I have had no opportunity of testing the method.

CHAPTER V.

ACUTE RHINITIS.

SIMPLE ACUTE RHINITIS, OR COLD IN THE HEAD.

IT seems hardly necessary to dwell at any length upon this common affection, familiar as it is to most persons, be they lay or medical. It is generally recognised that such causes as a chill or prolonged stay in a close atmosphere are often followed by a cold in the head.

Of all forms of chill, that resulting from cold feet is most frequently followed by acute nasal catarrh. In spring and autumn the affection may usually be said to be epidemic in most temperate climates. In measles, it is a marked feature of the disease, while it may occur in smallpox, scarlatina, and typhus. Further, acute rhinitis may result from, just as it may be followed by, laryngitis and bronchitis.

It need hardly be mentioned here that certain drugs, such as iodine and bromine, when taken internally, give rise to nasal catarrh.

Hot dusty air, or atmosphere charged with chemical irritants or poisonous substances, such as ammonia, phosphorus, chlorine, bromine, iodine, mercury, osmic acid, digitalin, hydrochloric acid, bichromate of potassium, and arsenic may give rise to rhinitis. When caused by the last three substances, destruction of tissue, followed by perforation of the septum, has been observed.

In spite of its common occurrence, the etiology of simple acute rhinitis is still uncertain. It is a perfectly well-known fact that the affection is contagious, and yet direct experimental proof of the fact has never been obtained.

Attempts to find the micro-organism which is presumably responsible for colds in the head have failed in an important point. Although Hajek has described a large diplococcus, which he terms "Diplococcus Coryzæ," as constantly present at the commencement of the attack, his observations are inconclusive in so far that he does not seem to have proved that this organism is capable of producing rhinitis in animals. After from twenty-four to forty-eight hours, other bacteria—among them Friedländer's pneumococcus—are also found in the nasal secretion.

It is well-known, since the late widespread epidemic, that influenza often attacks the nose, although in a considerable proportion of cases this region escapes. In this disease the spleen is, according to Brakenridge, moderately enlarged, and Friedreich has made similar observations in simple rhinitis.

It seems almost superfluous to dwell upon the *symptoms*. A feeling of chilliness or lassitude, associated with nasal obstruction, sneezing, and discomfort in the palate and naso-pharynx, is soon followed by serous discharge from the nose. As the affection advances the secretion becomes muco-purulent and then gradually subsides, for it is rarely that acute rhinitis passes directly into the chronic variety. The temperature and pulse are usually little influenced by the disease. Headache, affecting especially the frontal region, is common, and I believe that this is usually due to closure of the duct connecting the nose and frontal sinuses, with subsequent exhaustion of air in these cavities. That they are often the actual seat of inflammation is extremely improbable, considering the favourable course run in almost all cases. Sometimes the catarrh spreads by the lachrymal duct to the conjunctiva, and more frequently to the Eustachian tubes and middle ear.

In influenza both pulse and temperature are frequently high, great constitutional disturbance is present, the head, back, and limbs ache, while depression is marked, and complications, especially bronchitis, are common.

In infants the nasal obstruction of simple coryza is often a serious danger, as both sucking and sleep are seriously interfered with, if not completely prevented. As most persons have experienced, the power to smell and taste may be temporarily lost during a cold in the head.

Objective examination shows marked congestive swelling of the mucosa of the anterior and posterior nares, including the naso-pharynx. The soft palate too, and even the pharynx proper, often participate in the catarrh. As has been stated the secretion is serous at first and alkaline in reaction, to which property its irritating effects upon the skin of the nasal orifices and upper lip are due. After a time it becomes muco-purulent. As it is doubtful whether the nasal mucosa contains muciparous glands, this secretion must in great part be composed of the epithelium thrown off from the mucous membrane.

As I have before stated coryza, produced by the agency of bichromate of potassium, arsenic, and hydrochloric acid emanations, may lead to perforation and even destruction of the nasal septum with resulting deformity.

The *treatment* of simple coryza is usually conducted without the aid of a physician. Is there anything which will stop a cold in the head? is a common question. There is, I believe, no remedy which can be absolutely depended upon to do so. In this country spirits of camphor, taken internally, on sugar, or using as a snuff the formula recommended by Ferrier (morph. hydrochlor. gr. 2; bismuth subnitrat. ʒvi.; pulv. acac. ʒii.), are favourite methods of treatment. Our continental *confrères* have more faith in a mixture of ammonia, 5 parts; carbolic acid, 5 parts; spirits of wine, 15 parts; water, 10 parts,—of which a few drops are put upon a sponge or blotting paper, so that the fumes may be sniffed up. Solis Cohen speaks highly of the production of chloroform anæsthesia as a means of checking an incipient coryza. Smelling a menthol cone or camphor ball are also popular methods of combating a cold in the head. The local application of a 10 per cent. solution of cocain is of considerable value as a means of relieving the nasal obstruction. The same drug may also be employed as a snuff, and is said to be of use in actually checking the disease. This plan of treatment may prove of great service in the coryza of infants where danger is threatened from nasal obstruction, but a 5 p. c. solution will usually be found of sufficient strength. Menthol, either in the form of a 20 p. c. solution in olive oil, or as a snuff (1 part to 10 of boracic acid) may be used for the same purpose. In adults the employment of a chloride of ammonium inhaler may succeed in arresting an impending cold.

In severe cases warm baths or pediluvia to which mustard has been added, followed by the administration of a diaphoretic and opiate (in the case of adults) at bedtime is most serviceable. It is often advisable to add to these remedies a tumbler of hot negus or whisky toddy, and next day the patient should remain in bed or in the house, according to circumstances. The application of fatty substances to the nostrils, and the employment of fluid vaseline with Ruault's spray may be grateful in extreme cases. In young infants — if neither cocain nor menthol be successful in enabling the patient to take nourishment by suction — food may be administered with a spoon or even an œsophageal tube. Some authorities also recommend the introduction of tubes into the nostrils in order to permit of nasal breathing during sucking. Voltolini recommended syringing the nose with camomile infusion to which a little alum had been added, while the child is sitting up, and just before it is given the breast or bottle.

In coryza, due to poisonous emanations, Moure advises, as prophylactics, wearing plugs of cotton wool, and the occasional employment of a snuff, composed of alum, talc, bismuth, and benzoin. After the disease has become established he recommends antiseptic and alkaline washes together with general treatment.

PURULENT RHINITIS.

This is, fortunately, a rare affection, but may occur as a result of direct infection (contact with gonorrhœal secretion, or, according to some authorities, in infants as a result of maternal leucorrhœa), as a sequel of the exanthemata, *e.g.*, measles, scarlatina, diphtheria, smallpox, or without any discoverable cause. It does not seem to me proper to consider under this heading the purulent discharge from the nostrils which results from scalds, operations, and the presence of foreign bodies.

The *symptoms* are much the same as in simple coryza, but the discharge soon becomes purulent and is often fœtid. If the case be neglected caries of the nasal bones may result, and even death from pyæmia may supervene.

The *diagnosis* is arrived at after eliminating empyema of the accessory cavities, the presence of a foreign body (in which case the discharge is usually unilateral), diphtheria, and syphilis.

In my experience—a very small one in this affection, which, at all events in Scotland, is rare—scrupulous cleanliness maintained by antiseptic nasal washes (*e.g.*, boracic lotion) and sprays, together with attention to the general health (administration of iodide of iron and cod liver oil, with fresh air and milk), is all that can be done. If the probe reveals the presence of bare bone, no attempt at its extraction should be made unless there be a distinctly loose sequestrum.

FIBRINOUS RHINITIS.

In Europe this affection, first described by Henoch, and subsequently by Hartmann, as occurring in children, is extremely rare. It has been observed also by Seifert, Moldenhauer, and B. Fränkel, in Germany, while Ryerson and Potter have studied it on the other side of the Atlantic. It is now well-known that it attacks adults as well as children. Potter seems to have met with a large number of examples, and estimates that fibrinous exudation occurs in about 2 p. c. of all cases of rhinitis. The affection is characterised by the development of false membrane (composed of fibrin, entangling in its meshes leucocytes, and epithelial cells) in the nose.

The *symptoms* are those of ordinary coryza. The temperature is not more elevated, the pulse is but slightly quickened. In the only example of the affection I have met with (a case seen with Dr. Burn Murdoch) the most marked and distressing feature of the disease was the absolute nasal stenosis, somewhat relieved for the time by the removal of false membrane, but lasting with such slight intermissions for over a fortnight. In this case a second attack, which was of shorter duration, occurred some weeks after the first, and subsequently frequent repetitions took place. A tendency to recurrence does not appear to have been noted by others but—this fact apart—the case quoted seems to have been quite typical.

This disease is somewhat interesting in so far that it clearly demonstrates the occurrence of a non-diphtheritic croup of the nose.

I have not referred to the *diagnosis* further, as the intense local discomfort, together with the absence of all constitutional symptoms, make mistakes impossible.

Hartmann advises, as *treatment*, removal of the false membrane, followed by insufflation of iodoform. As the exudation tends rapidly to recur, this does not seem likely to be followed by much advantage. According to Potter—and my experience in the case above referred to corroborates his views—neither cocain nor any other drug gives relief. This authority recommends plugging the nostrils for a few minutes with cotton wool, as some little freedom of respiration follows its removal. Should I meet with another similar case, I should feel inclined to try injections of diluted lime water.

The *prognosis* of fibrinous rhinitis seems always to be favourable, so that its obstinacy in resisting treatment only means discomfort for a fortnight or three weeks.

DIPHTHERITIC RHINITIS.

This affection has already been referred to (*see* Pharynx). Primary diphtheria of the nose is not very uncommon in children. The marked nasal obstruction, associated with severe constitutional symptoms, and accompanied by a fœtid discharge, often mixed with shreds of false membrane, is usually followed by the appearance of the disease in the pharynx. It is unnecessary to refer further to the *treatment*, which has already been indicated.

PHLEGMONOUS RHINITIS.

Abscesses involving the mucous membrane of the nose—apart from furuncles near the orifice, which are readily diagnosed—are of rare occurrence.

The septum is the part most commonly affected. The affection, which often follows an injury, begins with considerable local pain, and may be associated with redness of the external nose and adjacent parts, while the pulse and temperature may indicate fever. On examination, a distinctly localised swelling is seen on one or both sides of the septum. At first the swelling is hard, but eventually fluctuation can be detected.

Should the patient come under observation before pus has formed, the local application of ice and iodine may succeed in preventing suppuration. When the presence of pus has been recognised, a free incision is required. Schäffer has observed these abscesses in children, and recommends not only incision but excision of a piece of mucosa and perichondrium, with subsequent scraping of the cavity with a sharp spoon. The cases of this affection I have met with occurred in adults, and simple incision sufficed.

In one instance, I have met with an abscess pointing beneath the mucosa of the inferior turbinated body, which, however, was due to an empyema of the antrum of Highmore. The pus had evidently burrowed beneath the mucosa, and found exit in the situation indicated, for although incision of the abscess gave temporary relief, a cure was only effected after opening the antrum.

RHINITIS DUE TO ACUTE DISEASES.

I shall confine myself in this section to a consideration of such points as have not been alluded to in the previous pages.

Glanders, as is well known, is a contagious disease, originating in horses, asses, and mules, and capable of being transmitted to the human subject. In man we meet with both the acute and chronic variety. The disease is essentially of the nature of pyæmia in so far as its clinical symptoms go, although from the researches of Löffler, Schütz, Israel, and Weichselbaum, there is probably a special bacillus at work.

During the course of the affection the nose is commonly involved, and if the patient's life be prolonged, the mucosa may be seen to pass from pustular and nodular infiltration to ulceration, followed by caries. As the general treatment is of more consequence than the local, we need only mention that antiseptic nasal washes should form part of the medication in the numerous cases in which the pituitary membrane is involved.

In *measles*, nasal catarrh is a prominent symptom, and ulceration of the septum is said to have followed this affection.

In *scarlatina*, the mucosa of the nose may become involved, and the rhinitis so caused may lead to destruction of tissue.

In *smallpox*, inflammation of the nasal lining membrane may occur when the characteristic pustules of the exanthem are located in this region.

Typhoid fever is occasionally, though rarely, followed by ulceration of the septum.

The same is true of *acute rheumatism.*

THE NASO-PHARYNX.

Acute inflammation of the naso-pharynx is common, but is usually associated either with acute pharyngitis or coryza. It is therefore unnecessary to discuss it further, more particularly as no special treatment is usually required.

CHAPTER VI.

CHRONIC RHINITIS.

UNDER this heading I intend to include—(1.) Chronic nasal catarrh, usually associated with hypertrophy of the mucosa; (2.) chronic atrophic catarrh, fœtid rhinitis, or ozæna; (3.) the various forms of chronic naso-pharyngeal inflammation.

CHRONIC HYPERTROPHIC CATARRH.

It is difficult to speak with authority as to the *etiology* of this affection. That repeated attacks of acute catarrh act as a more or less direct cause is probable, and it necessarily follows that close and irritating atmosphere, excessive use of tobacco or stimulants, and want of hygienic precautions generally, tend to the same result. Clinton Wagner believes that a form of chronic rhinitis met with in plethoric persons who live freely is due to a gouty or rheumatic diathesis. Certain morbid conditions of the nose, such as deviations of the septum, adenoid vegetations of the naso-pharynx and polypi, are commonly associated with rhinitis.

In hypertrophic rhinitis the mucosa of the nostrils is thickened and hypersecretion is not uncommonly a prominent symptom. It is unnecessary to touch further upon the pathology, which will be discussed more in detail in considering the results of objective examination, and I should have refrained from any mention of it now had I not desired to call attention to a great difficulty which besets the rhinologist. Rhinology has made rapid strides of late, and operative rhinology has accomplished much for the benefit of humanity. It has, however, added something to the suffering of mankind. As a student of rhinology for more than a decade, with considerable clinical material at command, I know what the ideal normal nose should be. As an aurist who examines the anterior nares in most cases, I also know full well how far this organ may deviate from health, if a normal nasal mucosa be implied by the use of this term, without occasioning any symptoms referable to the part. I would therefore contend that at present we know as the normal an ideal which is not often met with. Indeed, if ten persons who, in answer to leading questions, state positively that they are not in any way troubled by symptoms referable to their nose, be examined, the probability is that more than half will show such evidence of disease, *e.g.*, spines on the septum, thickening of the mucosa over the turbinated bodies, &c., as would lead to severe operative measures being advised by many rhinologists, if they were to carry out what they advocate. This excessive operative zeal appears to me to be a great danger, threatening, as it does, the credit of our profession as a whole, and rhinology in particular. Recently an authority is reported (wrongly reported, I trust) to have stated before a medical society in America that he cured diseases of the internal ear by operating on the nose, and his remarks do not seem to have excited laughter. I have dwelt, perhaps, unduly on these points, but the practical outcome I desire to lead up to is this: let no surgeon be induced to operate on the nose, simply because there is some degree of hypertrophy of the mucosa, unless the symptoms are sufficiently important to warrant such interference.

Let us now turn to the *semeiology* of hypertrophic catarrh,—a point of great importance, because the treatment employed should be energetic just in proportion to the discomfort it is designed to relieve.

Nasal obstruction is present in all well marked cases, but it varies much in intensity according as swelling of the turbinated erectile tissue is present or absent. Not uncommonly, while absent during a great part of the day, it is present at night. If the hypertrophy be very marked, the character of the voice is altered, while the constantly open mouth gives the patient a stupid expression. A feeling of weight in the head and inability to fix the attention is sometimes complained of. These symptoms are probably due to closure of the communication between the nose and frontal sinus, with rarefaction of the air contained in that cavity; the atmospheric pressure on the forehead is then necessarily felt to an uncomfortable extent.

Smell, and even taste, may be interfered with, and it is a noteworthy fact that anosmia may be caused by hypertrophy confined to the middle turbinated bodies, and so slight in amount that no other inconvenience is experienced. Closure of the anterior portion of the olfactory cleft (*i.e.*, the space between the free margin of the middle turbinated body and the septum) seems, according to my experience, to be capable of causing loss of the sense of smell. Hypertrophy of the middle turbinated bodies may also give rise to redness of the tip of the nose.

In most cases of nasal catarrh there is a marked tendency to sneeze, and sometimes such severe paroxysms occur that this symptom alone compels the patient to seek advice.

Hypersecretion is another common complaint. Most commonly the discharge is either serous or viscid from admixture with mucus. As pointed out by Moldenhauer, however, it may be purulent, and, in the case of unhealthy children, may have a distinctly unpleasant odour, but as a rule, the secretion is devoid of smell. Hypertrophic catarrh, associated with fœtor, is very uncommon, and I can only recall a few examples. In all cases where the secretion is purulent and fœtid, care should be taken to exclude an empyema of one of the accessory cavities. The connection between chronic rhinitis and middle ear disease will be discussed in a future chapter, while the occurrence of certain reflex neuroses has been already referred to.

Objective examination reveals more or less increased redness of the mucosa. Certain parts are also thickened; thus the anterior extremity of the inferior turbinated body may often be markedly enlarged, and only diminishes slightly in size on the application of 10 or even 20 per cent. solution of cocain, thus showing that the case is not one of simple erection. The mucosa covering the whole bone (inferior turbinated) is often corrugated as well as thickened. The middle turbinated is not so frequently affected as the inferior, nor does it usually show such marked hypertrophy, but it is not uncommon to find it apparently pressing upon the septum.

Posterior rhinoscopy frequently reveals enlargement of the posterior extremities of the inferior turbinated bodies. When thickened, the part often appears as a peculiar mulberry-like tumour projecting into the naso-pharynx. The middle turbinated may also be enlarged in its posterior part, but this is less common.

The *diagnosis* of hypertrophies—especially those seen by anterior rhinoscopy—depends upon the colour and consistence of the parts. Small polypi may be mistaken for thickened mucosa, and indeed there is a condition of the middle turbinated body occasionally met with which can most correctly be termed polypoid hypertrophy. As a rule, however, hypertrophies are of a pink or deep red colour, while polypi have a greyish-blue translucency peculiarly their own. In order to distinguish hypertrophied mucous membrane from osseous or cartilaginous tissue, its consistence, as tested by the probe, will suffice, while the undefined thickening of the parts serves to differentiate it from other tumours. Hypertrophy of the posterior extremity of the inferior turbinated body might readily be mistaken for a tumour, but its situation, the peculiar mulberry character, and examination with the probe or finger, will usually suffice to prevent an error.

As I have repeatedly endeavoured to point out the *treatment* must be active or the reverse, according to the severity of the symptoms produced. It is further to be noticed that the treatment should vary according to the prominent symptom or symptoms, for relief of which aid is sought. Thus a patient complaining only of some little excess of secretion and occasional blocking of the nose may be advised to use an alkaline injection (*e.g.*, chloride of sodium, bicarbonate of sodium, or borax, a teaspoonful to a pint of water), or the chloride of ammonium inhaler. If fœtor be present a solution of boracic acid, chlorate of potassium, or aceto-tartarate of aluminium should be employed. The injection of astringent solutions (*e.g.*, tannin) may also be tried, while many authorities advise the insufflation of nitrate of silver[1] diluted with starch, aceto-tartarate of aluminium (usually diluted), aceto-glycerate of aluminium, and tannin, all of which remedies are employed as fine powders. In using fluid injections care must be taken—if a syringe be employed—to instruct the patient to inject the fluid into the nostril, which is less pervious, so as to avoid the danger of middle ear inflammation. If it be desired to act only upon the anterior nares a spray may be used with advantage. As an astringent Cresswell Baber recommends rectified spirit, which, according to his experience, does not endanger the sense of smell. In cases of marked obstruction Morell Mackenzie advises the application of pressure by means of his graduated bougies. In obstinate cases, however—and under this category I would include most of those which resist simple alkaline injections and sprays—caustic applications are most useful, but here it is necessary to enter somewhat into detail.

If nasal obstruction be the chief complaint, the symptoms usually depend upon marked hypertrophy of the inferior turbinated body. If the thickening be so situated that it can be caught in the loop of the galvano-caustic snare it should thus be removed *en bloc;* if the snare be only heated to a dull red heat, and tightened slowly, little hæmorrhage is likely to result. The manipulation may be facilitated by transfixing or grasping with forceps the part to be removed before applying the snare. If snaring be not applicable, a flat burner may be employed to destroy the hypertrophied part. If the enlargement be largely due to erectile swelling it is often a good plan to plunge a sharp pointed burner into the tissues, and thus cause adhesion between the periosteum and mucosa. The superficial sloughs produced by the electric cautery tend to fall off in a period varying from a few days to a fortnight; if the pointed burner be employed, the deep sloughs seem to be absorbed without suppuration. The process must be repeated until the nostril is pervious, and intervals of a week or fortnight should be allowed to elapse between the applications. It is extremely desirable that the patient should, during the periods of sloughing, avoid exposure to septic influences, and should there be much discharge as a result of the operation the nose may be syringed with boracic lotion. Hypertrophy of the posterior extremity of the inferior turbinated body is somewhat difficult to treat. In some cases it is said to be necessary to snare it off—a manipulation commonly requiring the index finger of the operator behind the palate. With the aid of good illumination, which enables the surgeon to see well into the inferior meatus, however, a cautery point can usually be applied to the required spot. As pointed out by Greville Macdonald, these enlargements are often made to disappear by comparatively slight attacks. A method I have sometimes adopted is to pierce the mucosa of the inferior turbinated body as far back as possible with a spearlike burner, and then push it further backwards so as to make it penetrate the hypertrophied posterior extremity. In destroying tissue, if the electric cautery be not at hand, a considerable effect may be obtained by employing a bead of chromic acid.

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[1] Nitrate of silver may also be applied in solution by means of cotton wool held by forceps.

It is, however, in another class of cases that I believe this remedy to be peculiarly efficacious, viz., those in which some nasal obstruction actually exists, but in which the symptom chiefly complained of is hypersecretion. In such cases it is desirable to apply the bead to such parts as are most thickened;

but probably owing to the unavoidable diffusion of the caustic, the remedy seems at the same time to produce a general astringent effect.

In patients whose chief complaint is paroxysmal sneezing it is well to employ a probe, in order to detect those areas which are most sensitive. This must, of course, be done before the application of cocain, and after they have been detected the electric cautery is applied to these points.

In patients who have lost their sense of smell the middle turbinated body should, if hypertrophied, be attacked. It is necessary, however, to be careful not to burn the septum at the same time lest adhesions should result. In redness of the tip of the nose, when associated with such hypertrophy, the same treatment is indicated.

If the patient be in a position to try change of air as an adjunct to local treatment, a dry atmosphere, free from dust, should be selected. Certain Spas, such as Ems, Bath, and the sulphur springs of the Pyrenees are occasionally useful. Local treatment is, however, of most importance. In certain cases—those associated with a gouty diathesis and plethoric habit—the exhibition of Carlsbad salts and restriction of diet on general medical principles is often useful.

CHRONIC ATROPHIC CATARRH (*Synonyms*—FŒTID RHINITIS. OZÆNA).

The relation of atrophic catarrh to the form just described is uncertain. In the former the pathological characteristic is atrophy of the nasal mucosa. This atrophy is commonly most marked in the inferior turbinated body, which is diminished in some cases to such a degree that it can only be distinguished with difficulty. It is probable—nay, certain—that in advanced cases the osseous tissue is atrophied as well as the mucosa. In not a few instances the middle turbinated body is also diminished in size, and frequently the mucosa of the naso-pharynx shares in the atrophy and resulting tendency to the inspissation of secretion. It is of the utmost importance to bear in mind that in ozæna the only naked-eye pathological condition present is atrophy of the parts. As an immediate result the nose is, of course, much more roomy, but ulceration is never present in atrophic rhinitis proper. The microscopic characters have been studied by Gottstein, Krause, and Habermann. The first-named found the epithelium well preserved and normal, while immediately below it there was a layer of round cells and fibres; the blood vessels and glands were numerous, but the contents of the latter were opaque. Krause, on the other hand, describes the epithelium as only here and there retained, the mucosa covered with coarse papillæ, the submucous tissue composed largely of cells and fibres, many of which are undergoing fatty degeneration; immediately beneath the fatty layer he found organised firm fibrous tissue, while all the blood vessels were thickened, and most of the glands had disappeared. Habermann has recently found marked fatty degeneration of the glands, and he is inclined to consider the fibroid changes in the soft parts as secondary to this cause. Schuchardt and Valentin have called attention to the fact that in ozæna the ciliated epithelium is often found replaced by the non-ciliated variety. The atrophied mucous membrane throws off a secretion which rapidly tends to dry, and after desiccation becomes extremely offensive, emitting the characteristic and loathsome odour of ozæna. The actual cause of this odour has given rise to much controversy. Thus, while Krause attaches much importance to fatty acids as a cause, E. Fränkel has described cases of undoubted ozæna in which there was no fatty degeneration. Zaufal, believing that in these cases the nose is arrested in growth, and that the turbinated bodies retain their infantile proportions, considers that decomposition is favoured by the diminished force of the respiratory current; in fact, this author seems to deny the occurrence of atrophy. Michel's view that the accessory cavities are always involved has been proved to be erroneous. In the secretions of ozæna organisms of various kinds abound, but I believe none of them have been found to have penetrated the tissues. Thus Löwenberg described a coccus which he considered to be the cause of the peculiar odour. Hajek found various organisms, among them Friedländer's pneumococcus, but names one "bacillus fœtidus," to which he ascribes the evil odour. Reimann also discovered an organism which, when cultivated on agar-agar, gives rise to a green colour and penetrating smell. We cannot, however, attach very much importance to the bacteriological observations so far made, owing to the divergent views which have been expressed, and the absence of any proof that such organisms are anything more than accidental products of decomposition.

The etiology of atrophic catarrh is, therefore, shrouded in mystery. It is stated by many authors that the pathological changes which characterise it are the results of a cirrhotic process in parts previously hypertrophied—in fact that atrophic is secondary to hypertrophic catarrh. This assumption is—and I state this with the full knowledge of one or two cases of supposed transitions from hypertrophy to atrophy actually observed—somewhat rash. Ozæna is a disease which is immensely more common in females than in males, and it usually appears either rather before or soon after puberty. These facts witness against the probability of any such gradual transition occurring, for hypertrophy is more common in males, and any slow cirrhotic process would not probably be completed so early in life. Those who have described the occurrence of such shrinking while the patients were under observation, have in all probability been misled by the succulence of the mucosa, common in young patients, which might easily be mistaken for hypertrophy. It is probable that any dyscrasia from struma to simple anæmia may predispose to atrophic rhinitis; but even when we admit such a predisposition in many cases, we are still at a loss to account for examples in which the victims are apparently quite healthy in all other respects. Ozæna seems sometimes to follow acute diseases, and it may also occur in the course of Bright's disease, and diabetes.

Atrophic catarrh commonly affects both nostrils, but it may be unilateral, as I have frequently observed.

Cozzolino has called attention to a disease which he terms *coryza caseosa,* in which the nostrils are filled with caseous masses. Most authorities are, however, inclined to consider such cases as accidental manifestations, which may result from various conditions, *e.g.*, disease of the accessory cavities, healed necrosis (often syphilitic), and the like. Stoerk's blennorrhœa has already been referred to in discussing the larynx; it is a disease only found in Central Europe, and seems not to have the same characters as atrophic rhinitis, although most authors refer to it under this heading.

The subjective *symptoms* of ozæna are not important. When crusts have formed there may be more or less obstruction, and patients are often conscious of the presence of these masses. Headache and distaste for intellectual effort are occasionally complained of. The most striking and painful phenomenon of the disease, the horrible stench which emanates from the nostrils, is usually not perceived by the patients. Although the sense of smell is as a rule impaired, it is not always, or even generally, lost, and yet the victims are not cognisant of the horrible odour. Very rarely reflex neuroses have been ascribed to atrophic catarrh.

On *objective examination* the nostrils are usually seen to be filled with greenish crusts, which tend especially to accumulate in the middle meatus. After these have been removed the characteristic atrophy of the parts can be studied. The inferior turbinated body is seen to be very small, and the orifices of the Eustachian tubes, the upper surface of the soft palate, and the posterior wall of the naso-pharynx can often be seen. The middle turbinated body may also be much diminished in size. The mucosa is generally somewhat pale, and is never ulcerated.

The naso-pharynx very frequently participates in the disease, and even the posterior wall of the pharynx proper may show signs of atrophy.

The *diagnosis* depends upon the leading symptom, associated with the presence of atrophy and the absence of ulceration. In unilateral cases the possibility of empyema of the antrum of Highmore must be taken into consideration. In this affection, however, the patient is usually conscious of a bad smell and taste, the pus is more fluid, and rarely tends to form crusts. Other characteristic symptoms will be discussed under accessory cavities. In doubtful cases, however, an exploratory opening into the antrum may be made.

Fœtid discharge may also be due to the presence of a foreign body or rhinolith, in which case, however, the parts are swollen, and sometimes covered with polypoid granulations. Syphilitic ulceration, too, may give rise to fœtor, either during the stage of ulceration or after healing. The presence of active ulcers in the one case, and the destruction of parts associated with cicatrisation, together with the history and age of the patient, will prevent mistakes.

The *prognosis* of ozæna, as regards a cure, is bad, but the disease does not tend to injure the general health to a very appreciable degree, and the most prominent symptom can usually be disguised by treatment. At the same time, in young women, it should form a bar to marriage, as the stench in the morning before the douche is used is intolerable. Moure believes that the disease is often curable, and he rightly lays stress upon observations which have shown that in many cases there is a tendency towards cessation of the fœtor with advancing years. Although disinclined to endorse the statement that ozæna is often curable, I have met with cases where, after prolonged treatment, the atrophy was less marked than before.

It should be remarked that exceptionally atrophic rhinitis is met with, which gives rise to no fœtor.

The *treatment* of atrophic rhinitis is simply summed up in the word cleanliness, for the chief aim of the physician must be to keep the parts free from secretion and crusts, which, in neglected cases, is at first no easy task.

It is well to begin treatment by means of an alkaline nasal douche, *e.g.*, a teaspoonful of bicarbonate of sodium, common salt, or chloride of ammonium to a pint of tepid water. If this be not sufficient to break down all the crusts a strong syringe may be employed, or the anterior nasal spray may be called into requisition. The solution, previously referred to, of borax (gr. 10), bicarbonate of sodium (gr. 10), and carbolic acid (gr. i.–ii. to the ounce of water) is very useful for this purpose. When the parts have been thoroughly cleansed, antiseptics are used—preferably by means of the nasal douche. The frequency with which the injections have to be made will depend upon the case. Some patients can keep the fœtor down by employing the douche once a day, while others are obliged to resort to it three, and even four times in twenty-four hours. By far the best prescription for a douche is, in my opinion, the aceto-tartarate of aluminium introduced into practice by Schäffer. A 50 p. c. solution of this drug is employed, and the patient is directed to add a small teaspoonful to a pint of water. The quantity may have to be reduced, but, as a rule, the strength indicated is well tolerated, and the patient is then directed to gradually increase the quantity until a slight smarting is experienced. The aceto-tartarate of aluminium employed in this way seems to act as a disinfectant, and is, at the same time, somewhat irritating and stimulating to the mucosa. The tincture of iodine, of which a few drops are added to a pint of water for the first application, may also be employed—the amount of the drug being here also increased according to toleration. Chlorate of potassium (ʒi. to a pint), boracic acid (ʒii. to a pint), and perchloride of mercury (1–10,000) may also be employed. I do not think that too much stress need be laid upon the form of the antiseptic; it is, however, important that a change of remedies should be instituted from time to time. After using the douche, and when most, but not all of the fluid has run out, it is beneficial to make the patient hold the nose and throw the head forwards, and in this way bring the upper part of the nostrils in contact with the remedy. Some authorities prefer to make applications by means of sprays; thus Lefferts advocates the compound antiseptic known as "Listerine," employed in this way.

Ruault has suggested the employment of a spray of fluid vaseline, in order to keep the parts lubricated and to prevent the formation of crusts. He also advises the application of camphorated naphthol—a fluid prepared by heating one part of naphthol with two of camphor—directly to the diseased mucosa. As a rule, this substance should be diluted with fluid vaseline, but the strength must be regulated according to individual toleration.

Voltolini seems to have treated most of his cases with nasal injections of tar-water, associated sometimes with the internal administration of the same remedy.

Gottstein advocates plugging the nostrils with cotton wool in order to stimulate the mucosa, and at the same time prevent desiccation of the discharge. These plugs are, however, often very uncomfortable, and their presence in both nostrils during the night can rarely be tolerated.

The insufflation of antiseptic powders, such as boracic acid, iodol, and the sozoiodol salts, and of irritants, such as galanga and sanguinaria, have been advocated; while recently the employment of nitrate of silver solution, employed in gradually increasing concentration up to 25 per cent., has been highly lauded by Meyjes. Pigments, too, such as solutions of iodine and balsam of Peru, have been employed.

B. Fränkel has suggested the application of the electric cautery, used in such a manner as to produce only a very superficial eschar, as a means of diminishing the formation of secretion; while Sajous strongly advocates this mode of treatment.

Bryson Delavan recommends the use of the constant current by introducing the negative electrode surrounded by moist cotton wool, into the nostril, and placing the positive pole on the back of the neck. A current of from 4–7 milliampères is employed.

It must be remembered that it is desirable to remove any manifest morbid conditions, such as anæmia, by appropriate treatment. Moure especially recommends sea air, and advises that during the time spent in a marine resort, sea water—more or less diluted with plain water—should be employed as a nasal douche.

It is almost unnecessary to state that any obvious diathesis, *e.g.*, the strumous, should be treated on general medical principles.

In cases where the naso-pharynx is markedly affected, it is desirable to apply such remedies as iodine or carbolic acid in glycerine (30 gr. ad. ℥i.) to the posterior nares by means of a bent brush. Powders such as have been already mentioned may be applied to this region with the laryngeal insufflator, or sprays with a curved nozzle may be used.

Chronic Post-Nasal Catarrh.

More or less participation of the naso-pharynx is common both in chronic rhinitis and in pharyngitis. To the association of atrophic nasal catarrh with a similar state of the pharyngeal vault, reference has just been made. Chronic catarrh of the naso-pharynx may be secondary to a similar condition of the anterior nares or pharynx. In these cases rhinoscopic examination usually reveals congestion of the parts with increased succulence of the mucosa, and sometimes swelling of the projecting orifices of the Eustachian tubes. Occasionally a very distinctly noticeable granular appearance is found, analogous to granular pharyngitis. In these secondary cases, the symptoms may be marked or absent. In cases of middle ear disease, it is of special importance to note the condition of the naso-pharynx, as we shall see in a later chapter.

The most marked symptoms of naso-pharyngeal catarrh are a feeling of discomfort behind the palate, the sensation of mucus accumulating in this situation giving rise to hawking or "drawing back through the nose," the act being followed by the expectoration of viscid secretion or even crusts. Other phenomena, occasionally met with, such as pain in the sternal region, occipital and frontal headache, and asthma are extremely rare.

Let us now turn somewhat more in detail towards the rhinoscopic appearances and characteristics of the various forms of chronic naso-pharyngeal catarrh which may be met with.

(*a*) The most simple form is that already described as being frequently secondary to affections of the throat and anterior nares. Whether secondary or not, the naso-pharyngeal discomfort in many cases is the symptom which drives the patient to consult his physician. The mucosa may—as has been before stated—be either granular or simply congested. Hypersecretion is often manifested only by the increased succulence of the mucosa, for at the time of examination no exuded mucus may be visible. In one or two particularly obstinate cases I have noticed that the cervical vertebræ presented a projection into the naso-pharynx, and I could not but connect this condition with the great discomfort occasioned by a comparatively slight catarrh. It is almost needless to say that every precaution was taken to exclude disease of the spine so that retention of secretion behind the prominent angle, together with the mechanical obstacle it presented to the application of remedies seemed to me to account for the marked discomfort and the obstinacy in resisting treatment.

It is surprising to note the different degree of discomfort occasioned by the same amount of catarrh in different individuals. Thus the aurist will find incidentally in a case of middle ear catarrh very marked congestion with hypersecretion; but the patient will be surprised when he is told that his ear condition is originally due to the naso-pharynx. In another case the observer will find the victim of naso-pharyngeal catarrh complaining bitterly of his local symptoms, but on examination detects a much less degree of catarrh. This seems to indicate that the general health and condition of the patient have something to do with the amount of discomfort which arises from the affection.

The *etiology* of naso-pharyngeal catarrh is still a mystery. It is peculiarly a disease of the United States, where it claims as victims a large proportion of the population. Repeated attacks of acute naso-pharyngeal catarrh, affections of the anterior nares and pharynx, irritants — including hot rooms, dust, alcohol, and tobacco—and diathetic conditions, predispose to it.

Nervous irritability, whether due to neurasthenia, gout, or other causes, seems certainly to aggravate the symptoms by making them more perceived. There is, however, a form of naso-pharyngeal catarrh which is more or less directly due to errors of diet and a plethoric habit, and which is probably of gouty origin.

The *treatment* of this form of catarrh must be energetic in proportion as it causes symptoms. More especially must it be combated if the ears be involved through the Eustachian tubes. In order to avoid needless repetition, I may mention that this forms a special indication for energetic treatment in all forms of naso-pharyngeal disease.

When the anterior nares are obstructed it follows that the posterior nares are placed under diminished atmospheric pressure upon each inspiration through the mouth. Permeability of the nostrils should therefore be secured in all cases, and this alone may cure the naso-pharyngeal affection.

If the patient be neurasthenic or dyspeptic general treatment should precede local applications. In gouty persons restricted diet and aperient mineral waters must form part of the treatment.

It is often forgotten by authors that the naso-pharynx is reached by fluids syringed into the nostrils, and the alkaline injections mentioned in discussing anterior nasal catarrh are often useful. The chloride of ammonium inhaler is sometimes very serviceable, but not uncommonly quite useless in relieving the local discomfort.

Nitrate of silver (gr. 10 or more, ad ℥i.), chloride of zinc (gr. 15-30 ad ℥i.), and iodine (gr. 6, with iodide of potassium and glycerine) in solution, should be applied with a bent brush. Some authorities recommend the insufflation of powders, such as nitrate of silver (diluted as mentioned in discussing anterior nasal catarrh), pale catechu, persulphate of iron (1-3 of starch), and eucalyptus (1-2 of starch). The last is especially recommended by Morell Mackenzie. The same author speaks well of such Spas as Mont Dore and Bourboule; while American authorities advocate the employment of sulphur, cubebs, and ammoniacum internally.

(*b*) *Naso-pharyngeal Catarrh associated with Crust Formation.*—As we have seen, crusts may exist in the naso-pharynx in cases of atrophic rhinitis, where the disease extends into this region.

Crusts, usually of a greenish-grey colour may, however, be met with in cases in which anterior rhinoscopy reveals no abnormality. As pointed out by Tornwaldt these are commonly met with in the centre of the naso-pharyngeal vault, and if they be removed an orifice is usually found into which a probe can be introduced. This author described such cases as disease of the bursa pharyngea. Schwabach, and others, seem, however, to have demonstrated that the canal described by Tornwaldt is commonly, if not always, a result of pathological processes in the pharyngeal tonsil. Indeed, according to Schäffer, the true bursa pharyngea is situated at a considerably lower level, and is occasionally found diseased. It there gives rise to either a retention, tumour, or localised hypersecretion, situated just above the level of the soft palate. We are therefore driven to the conclusion that Tornwaldt's disease of the bursa pharyngea is really due to hypersecretion from the median furrow of the pharyngeal tonsil. The symptoms are those of post-nasal catarrh, associated with the presence of a crust extending from the roof of the naso-pharynx, near the septum, downwards and backwards.

The *treatment* recommended by Tornwaldt consists in destroying the secreting surface with the electric cautery or nitrate of silver. Since the observations of Schwabach were published, I have been in the habit of scraping the remains of the pharyngeal tonsil with Gottstein's curette, employed in the same way as for the removal of adenoid growths in children. If it be desired to try less severe measures, the same line of treatment may be employed as in the simple variety of naso-pharyngeal catarrh. The crusts, if tenacious, may be removed by alkaline douches or post-nasal sprays, or, if preferred, a post-nasal syringe may be used; afterwards local remedies of an astringent character are applied. Scraping, or the local application of the electric cautery are, however, both more scientific and more satisfactory in the results yielded. Kafemann also arrived independently at the same conclusion with regard to scraping. He employs for the purpose a sharp spoon, and afterwards cauterises the parts with nitrate of silver or chromic acid.

(*c*) *Naso-Pharyngeal Catarrh due to Hypertrophy of the Pharyngeal Tonsil.*—When this structure is much enlarged it gives rise to the condition known as adenoid vegetations. In adults the gland is usually so atrophied that it cannot be recognised as a projection. Sometimes, however, this retrogressive process does not go on to completion. The condition is recognised by posterior rhinoscopy when the vault of the pharynx situated between the orifices of the Eustachian tubes presents a thickened, irregular, and slightly projecting surface. If this condition be found in a patient who complains of the symptoms of post-nasal catarrh, and if these symptoms do not yield to the remedies suggested in discussing the simple form, more energetic measures may effect a cure. Here, again, I have had excellent results from applying Gottstein's curette. Although there is not sufficient tissue present to enable the operator to bring away any fragments, the passage of the instrument over the rough surface will destroy the projections, which probably act as foci of irritation, and keep up excessive secretion.

CHAPTER VII.

CHRONIC INFECTIVE DISEASES.

SYPHILIS.

THAT primary sores may occur in the nose or naso-pharynx has been shown, but this condition is fortunately of rare occurrence, although Burow has recorded several cases due to infection by Eustachian catheters.

No doubt syphilitic nasal catarrh occurs frequently in adults during the *secondary stage*, but its manifestations are usually so slight that its presence is overlooked.

It is different, however, with infants in whom the presence of obstinate nasal catarrh is rightly looked upon as a sign suggestive of specific disease. In infantile syphilis there is hypersecretion from the nasal mucosa, and the discharge has a tendency to dry up into crusts; thus nasal respiration is interfered with, and the act of suction becomes impossible. Not uncommonly the discharge is purulent, or it may be tinged with blood, while its presence irritates the parts adjacent to the nasal orifice. Infants so affected are commonly wizened, the bridge of the nose is often flat, cracks occur about the lips, and a macular or papular rash may usually be found on examination of the body, during which the palms, soles, buttocks, and genitals, should be carefully inspected.

The *treatment* of syphilitic coryza in infants is of considerable importance. The general health must be attended to on principles which are well known, *i.e.*, dietetic (nursing if possible by the mother, or a syphilitic wet nurse, or failing this good milk), tonic (syrup of the iodide of iron and cod liver oil), and specific (the administration of mercury either as grey powder or in the form of inunction or mercurial baths). It is of great importance to keep the nostrils as pervious as possible. This is best accomplished by spraying, and if necessary syringing with some antiseptic solution, such as boracic lotion. If the crusts are very tenacious they may be softened by the application of oily substances, with a camel's hair brush. It is useful to employ for this purpose a solution of menthol in olive oil (10 p.c.), as this drug has the property of temporarily relieving erectile swelling. The use of cocain can hardly be recommended in a chronic disease owing to its toxic qualities. In extreme cases the introduction of a tube through the nostrils may be necessary in order to admit of suction and sleep.

Tertiary syphilis of the nose is met with as a result of infection, or it may occur in the victims of an hereditary taint. It is not common to find the tertiary form occurring less than five years after infection, although exceptions are met with, more especially in tropical countries.

It is certain that the first phase of the local manifestation occurs in the form of a gummatous infiltration, which may even take the form of a distinct tumour. It is equally certain, however, that this stage is rarely observed, for when the patient consults a medical man ulceration has usually occurred.

Although any part of the nose may be attacked the septum is the favourite seat of tertiary lesions. As a rule there is considerable purulent discharge when the case is seen during the active stage of the disease. Fœtor is marked, but to the trained rhinologist the fœtor of syphilic ulceration is quite different from that of atrophic rhinitis. After washing out the nostrils marked ulceration may be seen, or the actual loss of substance may be covered by exuberant granulations; if, however, the probe be employed bare bone will usually be felt. If the septum be perforated it is of great importance to note whether the cartilaginous portion only is affected, or the osseous structures have also been involved, in cases where the disease is not active; for there is no doubt whatever that extensive perforations in the cartilaginous septum may occur without indicating syphilis.

As a rule syphilis is not difficult of *diagnosis*. It is rarely confounded with lupus, for the latter seldom attacks the interior of the nose as a primary disease, nor is it associated with rapid destruction of tissue, while the nodular appearance is more or less characteristic. Chronic glanders is a rare disease, but may resemble syphilis in its effects upon the nose. Tubercular ulceration may lead to perforation of the septum, but it is usually found associated with other evidence of phthisis. Caries of the osseous structures may result from purulent rhinitis, and from disease of the accessory cavities—especially the maxillary antrum. As a rule the history of the case, and the fact that syphilis commonly attacks the septum, will prevent mistakes. According to my experience, a perforation of the osseous septum is usually syphilitic, but a perforation of the cartilaginous plate alone is quite as often non-specific. Michelson considers that syphilitic ulcers of the septum are usually longitudinal, while tubercular perforations are round or irregular. In all cases where there is marked ulceration within the nose in a person apparently in good health, syphilis should first be thought of. In neglected cases falling in of the nose, the exfoliation of large sequestra and breaking down of the osseous partitions between the nostrils and accessory cavities may occur.

Occasionally syphilitic ulceration occurs in the *naso-pharynx*. Any part of this cavity may be affected, and, if neglected, the disease may finally cause caries of the vertebræ or closure of the Eustachian tubes. As Voltolini has pointed out an ulcer may be situated in the extreme posterior and upper part of the cavity, and thus escape observation by ordinary methods. For diagnosis in such instances he employed a bent mirror used as a palate hook, with the reflecting surface upwards, while another mirror was introduced in the ordinary way. The upper portion of the vault can, however, also be inspected by Dorn's method, *i.e.*, rhinoscopy practised while the patient's head hangs over a couch or table. Ulceration of the naso-pharynx should be suspected in persons, otherwise healthy, who complain of great pain on deglutition without the presence of any lesion in the throat to account for the symptom in question.

The *treatment* of tertiary syphilis should begin by the administration of iodide of potassium, and if the disease seems to be spreading rapidly this should be combined with mercurial inunction. At the same time it is desirable to cleanse the nostrils with antiseptic washes, such as boracic lotion. If loose fragments of bone can be detected they should be removed, and the margins of ulcers may be touched with nitrate of silver.

In those cases where great deformity has resulted from falling in of the nose, the appearance can be improved by wearing an artificial nose, kept in position by a spectacle frame.

TUBERCULOSIS.

Phthisis—though rarely—manifests itself in the nose, either in the form of tubercular tumours or ulcers.

Schäffer has been able to observe eight cases of *tubercular tumour*. In all of them the seat of disease was the cartilaginous portion of the septum; the growths, however, had a tendency to spread backwards, and also to involve the periosteum. The neoplasms were granular, and consisted of nodules sometimes as large as a small walnut; the colour varied from pale pink to dark red. In consistence the masses were soft, and, after their removal, the perichondrium was seen to be affected, and an ulcer with raised margins ensued. In three of Schäffer's patients, perforations of the septum followed. In two instances the growths were examined by Nasse, and in both the main bulk of the mass consisted of granulation tissue. In one, tubercles were numerous, but few bacilli detectable; in the other, there were no giant cells, but many bacilli.

Tubercular ulceration of the nose is also more commonly[1] found on the anterior part of the septum than elsewhere, although, as in a case described by Luc, it may be met with on the turbinated bodies.

It is the custom of authors to describe the occurrence of separate miliary nodules, of the size of a millet seed, which are said to break down and finally to coalesce into one or several larger ulcers. I have only met with one example of tubercular nasal ulceration, and in that instance there was a large perforation of the lower and anterior part of the septum. The surrounding mucosa was pale, showing here and there in the neighbourhood of the ulcer a yellowish point. The septum, too, and the margins of the perforation were thickened, and the latter were by no means clean cut, having, if I may be allowed the term, a plump appearance. There was very little discharge, and no local pain.

The symptoms seem in all cases to be only such as arise from mechanical causes. Thus, during the active stage of ulceration, considerable discharge may be present, while the presence of a tubercular tumour may cause nasal obstruction.

The *diagnosis* depends in the first place upon the co-existence of other evidence of phthisis which is usually present, although it is probable that the nose may be the first part attacked. In the case of tubercular tumours, the microscope will reveal the presence of bacilli; but Hajek points out that only the deeper portions of the growths should be used for this investigation.

The differentiation from lupus cannot of course be made by the microscope, and Bresgen contended that Schäffer's cases of tubercular tumour were really instances of this disease. Lupus has, however, quite different clinical characteristics. In the case of phthisical ulcers, microscopic examination of the secretion for bacilli will decide the question of diagnosis from syphilis

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[1] "More commonly" is perhaps hardly accurate, as nasal tuberculosis is a rare disease. The term, therefore, must be considered relative.

—especially when associated with the history and appearance of the mucosa and ulcer.

Phthisis may attack the naso-pharynx, where it produces ulcers, as described by Luc; or it may, as observed by Hajek, give rise to localised infiltrations on the posterior surface of the soft palate.

The *prognosis* is unfavourable, although healing does occasionally take place.

The *treatment* must be general and local. Into the former—which coincides with that of tubercular disease generally—it is unnecessary to enter. Scraping ulcers and removing neoplasms, each proceeding being followed by the thorough application of lactic acid, is the treatment most calculated to cure the local lesion.

If the general condition of the patient be such as to render the condition hopeless, it is ill judged to use painful methods of local treatment; but applications of menthol in olive oil (1–20) may be prescribed.

When the naso-pharynx is affected, a 20–60 per cent. solution of lactic acid may be applied with a brush.

What has been written concerning tuberculin and cantharidinate of potash in the chapter on Laryngeal Phthisis may be said to apply here as well.

LUPUS.

Tuberculosis has just been discussed, and it is now recognised that lupus has many pathological features in common with it. Thus, both giant cells and tubercle bacilli are met with in the microscopic examination of lupus. Some authors describe a form of ulceration as strumous which, in its effects and progress, presents all the features of syphilis. For my own part, I am inclined to think that most of such cases (which cannot be classed as either tuberculosis or lupus) are due to hereditary syphilis, while the remainder are probably the result of purulent rhinitis occurring in delicate or, if the term be preferred, strumous constitutions.

Lupus may attack the interior of the nose by spreading from the skin to the mucosa. It is, however, not very uncommon to find the dermoid lesion at some distance from the nose. Rarely the mucous membrane is attacked without evidence of the disease on the skin.

Lupus usually attacks young patients, and females oftener than males. The parts of the mucous membrane most frequently involved are the septum and inferior turbinated bodies. On inspection the affected mucosa is seen to be only slightly ulcerated. That is to say, there may be loss of substance, but the impression is conveyed to the observer that the destructive process is very slow, and little discharge is present. The characteristic appearance of lupus is the presence of small nodules from the size of a pin-head to three times as large, which are close together, but do not, in my experience, tend to coalesce. When felt with the probe they are somewhat resistant, and if an actual loss of substance exists, it is surrounded by these characteristic nodules. The appearances produced differ very distinctly from syphilis, where rapid sloughing of the infiltration usually takes place, and in which the small nodules are not seen. Tubercular tumours are, according to Schäffer, nodular, but the size, both of the whole mass and of the individual nodules, will probably prevent confusion with lupus. In tubercular ulceration there is a tendency to form small ulcers which coalesce, and the characteristic nodules of lupus are absent.

The *treatment* of lupus should be energetic. Cod liver oil, iron, and arsenic, or iodide of potassium may be given, but local treatment is of more consequence.

Every trace of nodular infiltration should be destroyed. The electric cautery may be used for this purpose, but I prefer the sharp spoon, followed by the application of chromic acid. Lactic acid I have not found nearly so satisfactory, although I occasionally prescribe it as a home application for those who cannot be seen regularly. Even after the disease has been eradicated and cicatrisation has taken place, the patient should be examined from time to time. The most satisfactory results sometimes follow this treatment, although the danger of recurrence is great.

As to the effects of tuberculin in lupus, the prevailing opinion, based upon observed and recorded cases, seems to be that while a temporary cure is often effected, recurrence is the rule rather than the exception.

RHINOSCLEROMA.

This curious and rare disease consists of a cellular infiltration associated with the development of fibrous tissue and consequent shrinking of the affected parts. According to recent researches there is a marked tendency to hyaline degeneration, both in the cells and intercellular substance. It is now generally admitted that the disease is due to a micro-organism, as was first pointed out by Frisch and Pelizzari. Two forms of organisms are described; the one short and rod-like, the other bearing a strong resemblance to the diplococcus of pneumonia as described by Friedländer. As yet endeavours to inoculate rhinoscleroma have failed, but commonly enough pneumonia and pleurisy have resulted in some of the lower animals experimented upon.

According to Matlakowski the disease has been chiefly observed in Austria, Russia, Italy, and America. A case has been fully described by Semon and Payne, but in that instance the patient was a native of Guatemala, while Davis has described an instance in an Egyptian.

Rhinoscleroma may begin on the upper lip, alæ of the nose, or in the pharynx. The affected part is nodular and of a pale or dark red colour, and the disease is especially prone to invade the inferior meatus of the nose, and thus cause obstruction. It may attack the larynx, as we have already seen, and is probably the cause of certain forms of hypertrophic laryngitis. Although the disease has no tendency to ulceration, loss of the uvula has been described in several reported cases, destruction of parts resulting from the gradual development of contracting fibrous tissue within the substance of the infiltration.

The *diagnosis* depends upon the extreme hardness of the growth and the absence of any tendency to ulceration, which negative characteristic at once distinguishes the disease from syphilis.

Rhinoscleroma is a slow disease, but at the same time it seems to be rarely cured. Injections of iodine, arsenic, salycilic, carbolic, and pyrogallic acids have been advocated. Doutrelepont was enabled to effect a cure by repeated inunctions of lanolin containing 1 per cent. of corrosive sublimate; and Heryng records a successful case in which not only the nose was affected. In the nostrils he destroyed the obstructing tissue with the galvanic cautery and chromic acid, while the laryngeal stricture was treated by methodical dilatation. The latter method may also be practised in the nose by employing tents of tangle or tupelo wood.

OTHER CHRONIC INFECTIVE DISEASES.

In a previous chapter, *glanders* has been referred to, and it is only necessary to repeat here what has already been stated, that the disease is occasionally met with in a chronic form.

Leprosy also may attack the pituitary membrane. At first there is a tendency to bleeding, and, according to Hillis, the mucosa is red and velvet-like. Later, tubercular thickening, finally followed by ulceration and falling in of the nose, may follow. In the only case of nasal leprosy I have met with, rhinoscopic examination showed a diffuse thickening rather than a tubercular appearance of the turbinated bodies, followed by ulceration and fœtid discharge. The diagnosis should not be difficult, as the features of the general disease are always marked. The treatment can of course only be symptomatic.

CHAPTER VIII.

TUMOURS.

TUMOURS OF THE ANTERIOR NARES.

BEFORE discussing these in detail, it may be well to recall the fact that the cartilaginous and osseous outgrowths from the septum, so commonly met with, have already been considered in a previous chapter.

Simple Connective Tissue Tumours.—The form of tumour known as mucous polypus is by far the most common variety of neoplasm met with in the nasal cavities.

The *etiology* of these growths is shrouded in mystery, and has given rise to much speculation — resting, however, not always upon a sound scientific basis. As a matter of fact we must confess that our knowledge of the processes which precede polypus formation is almost nil. Probably a more or less œdematous state of the mucosa covering the middle turbinated bodies and adjacent parts often exists for a time prior to tumour formation. Gradually, owing to diminished resistance at certain points, projections occur, and then the force of gravity steps in, aided by the suction which is exercised by the respiratory current as it passes to and fro through the nose. The projected part thus hangs downwards, becomes more œdematous, and therefore larger, while very often the dependent extremity assumes a bulbous shape. This explanation is sufficient to account for the development of certain polypi, but it does not satisfactorily explain the existence of others. Polypi are more common in men than in women, and rarely occur in young people (*i.e.*, under fifteen).

It will be necessary here to enter somewhat into pathological details, as much uncertainty seems still to exist with regard to the histology of mucous polypi. There can, I think, be no doubt that the term myxoma, so often employed, is quite inaccurate. These growths consist invariably of loose œdematous connective tissue. No doubt, on examining numerous specimens, patches of myxomatous degeneration will occasionally be found; while in some, glandular elements are seen in considerable quantity. Then again, in other sections, dilated vessels may appear; while, in yet another group, cystic spaces have developed. In exceptional cases, one of these becomes much enlarged, containing quite a large quantity of fluid; while in one instance, Michael found an air-containing cavity within a polypus. I believe, however, that in most cases the bulk of the tumour will be found to consist of—as before said—œdematous connective tissue. Occasionally the œdema is absent, and the tumour is much more resistant, and, when examined under the microscope, it is found to consist of fully developed fibrous tissue. The growths are generally attached to the middle turbinated body, or to the outer wall of the middle meatus. They are usually smooth and rounded in outline, and of a translucent bluish-grey colour peculiarly their own. In shape they vary, being often pear-shaped; but occasionally the polypoid tissue forms a veritable fringe, with an attachment along almost the whole length of the middle turbinated body. Occasionally it can hardly be said that a distinct tumour exists, and the appearance seems to indicate that the visible part of the middle turbinated body is infiltrated with polypoid tissue, which, however, has no distinct pedicle; this condition is usually termed polypoid hypertrophy.

Tumours having a microscopic structure similar to those just described, but differing considerably in macroscopic characters, are also met with in the lower part of the nasal cavity. They occur on the inferior turbinated body, and even on the floor of the inferior meatus and adjacent parts of the septum. These growths are characterised by the irregular papillary appearance of their surface, and have been designated by Hopmann papillomata. They are of rare occurrence. In colour they are pink or red, with occasionally an approach towards the grey translucency of the nasal polypus proper. In consistence they are soft, and their surface is cleft by papillary projections, producing a resemblance to a cockscomb. In one case under my care masses of this tissue, arising from the floor and adjacent septum, blocked the posterior part of each inferior meatus; indeed, the condition was more analogous to that sometimes seen in multiple papillomata of the larynx, and yet, when a portion of the tissue was examined, it was found to have the structure of a simple soft fibroma.

To sum up we may include under our present heading the following varieties :—

(1.) Common mucous polypi, which are usually multiple and bilateral, of bluish-grey translucent appearance, and vary in size from a pea to a walnut, or even larger.

(2.) A polypoid growth, usually single, of red colour, and firm consistence, of extremely rare occurrence.

(3.) Papilloma-like growths arising from the inferior turbinated body or adjacent parts, single or multiple, of rare occurrence.

In all cases it is advisable to subject a fragment of the growth to microscopic examination should it not have the unmistakable characteristics of the common mucous polypus.

Other varieties besides those already mentioned have been described. Thus several examples of angioma have been recorded; in some instances these were true vascular tumours, but probably in others simply fibromata, with unusually dilated vessels. Adenomata have also been classed as a distinct variety, but here, too, it is questionable whether two distinct varieties of neoplasm have not been included under the term, viz., mucous polypi, with undue development of gland ducts, and a form of malignant growth.

The *symptoms*, of course, vary according to the size and number of the tumours. In cases where the nares are filled with nasal polypi, the symptoms are chiefly those of nasal obstruction, which becomes more marked in damp weather, and less troublesome in a dry atmosphere. The voice is markedly nasal, and, in some cases, the experienced rhinologist will suspect the existence of polypi from hearing the patient speak. It is very rarely that any external deformity results from the presence of even large mucous polypi, but these growths may, by obstructing the lachrymal duct, give rise to epiphora, and occasionally they seem to cause empyema of the antrum of Highmore by occluding its orifice, and so preventing the entrance of air, thus placing the mucous lining in a position analogous to a surface under an exhausted cupping glass. It is unnecessary to dwell at any further length on the symptoms of nasal polypus when the affection is so marked as to cause nasal obstruction, as an examination with the speculum will at once reveal the nature of the case. Small polypi may, however, cause symptoms which are of some importance. Thus nasal reflex neuroses—especially asthma and cough—may be due to this cause. The growths which may give rise to these phenomena are usually small and pedunculated, and the local discomfort is often such as to attract but slight notice from the patient.

Small growths also occasionally cause much serous discharge, necessitating frequent recourse to a pocket handkerchief. Sometimes loss of smell is due to the presence of a fringe of very small polypi blocking the olfactory cleft between the middle turbinated body and septum.

It is unnecessary to refer specially to the symptoms of the other forms of connective tissue growth mentioned, except to state that in the case of angiomata, hæmorrhage is of course liable to occur.

The *diagnosis* of mucous polypus is very simple in typical cases. On inspecting the anterior nares a tumour of a greyish-blue translucent appearance is observed which differs from the inferior turbinated body in colour, and in the fact that it is usually freely moveable with the probe. Even in less pronounced cases careful inspection will usually enable the observer to diagnose the existence of polypus. Where the growths are small and situated far back or high up, diagnosis is considerably facilitated by applying cocain, in order to cause collapse of the erectile inferior turbinated body. In some instances a small polypus may be suspected to spring from the posterior part of the middle turbinated body after examination with the speculum, and the suspicion is changed to certainty by employing posterior rhinoscopy, preferably with the aid of the palate hook. It must, however, be remembered that the posterior extremity of the middle turbinated body has also often a bluish tint when seen in the mirror — not altogether unlike polypoid tissue. Diagnosis is sometimes extremely difficult in the case of small growths associated with hypertrophy of the mucosa, and deviation or thickening of the septum.

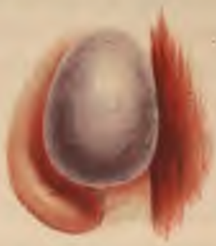

FIG. 22.—Mucous polypus (right nostril).

Papilloma-like growths, as they occur upon the inferior turbinated body, are more red in colour than mucous polypi, but their recognition presents no great difficulty. Fibrous tumours of more firm consistence, also, are much more of the colour of mucous membrane, and are further distinguished by the resistance they offer when probed. Angiomata are said to occur most frequently on the septum, and to be commonly of a reddish or purple colour, with, of course, a great tendency to bleed.

I cannot refrain from mentioning here once more the importance of microscopic examination in all nasal tumours which do not present the typical characteristics of mucous polypus.

The *prognosis* is distinctly favourable, although all the forms mentioned—with, perhaps, the exception of angiomata—tend to recur after removal. It must not be forgotten, however, that Bayer has recorded examples of malignant degeneration of pure mucous polypi, and Voltolini has repeatedly noted cases where innocent growths, when removed, revealed the existence of malignant disease behind them. It is well for the surgeon not to commit himself as to the number of mucous polypi in any given case, where the first tumour hides the deeper parts of the nostril from view.

The *treatment* of nasal polypi consists of two stages, where the growths are of any size, viz.—(1) Removal; (2) Cauterisation of the pedicle.

The old-fashioned method of treating polypi was rough and ready. A dressing forceps was introduced into the nostril, and the growth twisted off. The objections to this method are—(1) Unnecessary pain; (2) Deficiency in accuracy; (3) If not followed by cauterisation of the pedicle recurrence is likely—indeed, almost certain—to take place. This method is now seldom justifiable, but very rarely cases are met with where, owing to the consistence, shape, and size of the growths, the forceps introduced into the anterior nares, and aided by the operator's finger behind the palate, are more successful than the snare. It must also be remembered that surgeons, who constantly practice this method, become possessed of a certain *tactus eruditus*, which goes far to replace the sense of sight. It is, however, only in those cases, I repeat, where the use of the snare is impossible, that the forceps employed in this manner has any justification.

In the case of distinctly pedunculated growths of fairly firm consistence, the best method of removal is undoubtedly the cold snare armed with steel wire. As large a loop as possible is—after the thorough application of cocain—introduced along the septum vertically, so far that the end of the instrument is quite close to the tumour, and then turned horizontally and pushed upwards. The loop is then tightened, and the whole mass forcibly pulled out. In this way more than one polypus may sometimes be removed, and the growth, or growths, usually becomes detached at the pedicle. The only objection to the method is that, after one or two introductions of the instrument, hæmorrhage is generally sufficient to prevent accuracy of vision, and further interference has to be put off until bleeding ceases. The advantage of the method consists in the fact that the growths are usually torn off from their insertion.

The galvano-caustic snare is useful when it is essential to clear the nose at one sitting, as if the wire be only at a dull red heat little or no bleeding occurs. It is also serviceable in cases of broad-based polypi, where the cold snare is liable to slip, for if the current be turned on as the wire is tightened the latter tends to make for itself a furrow. When the growths are very small or difficult to reach, the extremely delicate structure of Schech's snares makes them very useful, and these instruments can also, if desired, be employed without heating the wire.

When the polypi are situated so far back in a narrow nostril as to make the employment of the snare difficult, they may be forced forwards by expiratory efforts through the nose, and then caught by catch forceps, over which the loop of wire is slipped. They may also be brought forward by proceeding as in plugging the posterior nares, and then by traction on the string dragging the pledget of lint towards the orifice of the nostril. Sometimes this traction may, with advantage, be carried so far as to drag the plug out of the nostril—a proceeding which is not so painful as would at first appear, and which often brings away a considerable quantity of polypoid tissue. If the nose be examined immediately afterwards, it is often found that a tumour previously far back has been brought forward, where it can be held with catch forceps. When the polypoid tissue springs as a fringe from the free margin of the middle turbinated body, it is an advantage, rather than otherwise, to include a portion of the bone in the loop. When this is attempted, however, either my écraseur instrument, Jarvis' snare, or the heated wire, should be employed.

When the tumour is suspected to be of a fibrous nature one of these instruments also ought to be used, both with a view to avoiding hæmorrhage and also to ensure division of the snared tissue.

I have had no experience in operating on angiomata, but the electric cautery or electrolysis are obviously the most suitable methods.

After mucous polypi—and this applies also to papillomata and to those rare cases of firm fibrous tumour of the anterior nares—have been removed, a tendency to recurrence exists so long as any of the pedicle is left. It is, therefore, necessary after the nose has been cleared, to destroy, as far as possible, every vestige of polypoid tissue, for which purpose several sittings are usually required. This is best accomplished by means of a platinum point, heated by electricity; but if this be not at hand chromic acid fused on a probe is a very efficient substitute. Even after this has been accomplished it is desirable to see the patient from time to time during several months in order to attack any tissue which may have escaped notice. In the case of the common mucous variety, the colour of the polypoid tissue is so distinctive that cauterisation of the pedicle presents no difficulty. The galvano-caustic point or chromic acid are used without previous employment of the snare, both for very small tumours, and when the polypoid tissue is present, more as a diffuse infiltration than a localised tumour. If the patient has to be dismissed before all traces of the growths have disappeared, he should be directed to employ a spray of rectified spirit twice a day for a month, and afterwards to repeat it on the slightest indication of "stuffiness." This treatment, first recommended by my colleague, Mr. Miller, and afterwards suggested by Politzer and myself for aural polypus, is simply invaluable. I generally advise that the spirit should be diluted with two parts of water, for the first application, and afterwards the strength increased to a half, and finally—if no pain ensues—that the undiluted spiritus vini rectificatus be employed.

After-treatment of the kind here recommended has been rejected as unnecessary by Bosworth, who states that after removal with the snare, he is unable to distinguish "the base from which a polypus has been severed;" but this view does not accord either with every-day experience or with the statements of other authorities. If a purulent discharge persists from one or both nostrils after all the sloughs produced by cautery or caustics have disappeared, disease of one of the accessory cavities —probably the antrum—may be suspected. During cauterisation of the pedicles, or rather while the cauterised tissues are being thrown off, boracic lotion may be employed for syringing the nostrils, and it is also important during this period to prevent exposure to septic influences.

Very considerable difficulty is sometimes met with in operating upon polypi, which, although springing from the middle meatus are situated so far back as to project freely into the naso-pharynx. I have recently found that such growths can be removed by means of a blunt hook—as suggested by Lange—even when all other methods have failed (compare also section Fibro-mucous polypus of naso-pharynx).

Cysts, osseous, and other tumours.—Cystic growths in the nasal passages are of rare occurrence. Cases have been recorded where echinococcus cysts were found in the nose; occasionally the variety of cyst known as dermoid has also been met with, and examples are on record of the extrusion of teeth from the anterior nasal passages.

Johnson and Lefferts have described cysts arising from the middle turbinated body, while Watson has also placed on record a case in which, what appeared to be a nasal polypus, turned out on examination to be a multilocular cyst. I have operated upon a nasal polypus which was almost entirely converted into a cystic cavity, so that on its removal a very large quantity of fluid escaped. R. Horsley has recently described the occurrence of what he took to be a cystic growth arising from the posterior extremity of the inferior turbinated body, and Seiler has also recorded a case of cyst, but I am unable to state its point of attachment. In a young woman I found a cystic tumour which caused bulging of the mucosa just below the anterior extremity of the inferior turbinated body. An exploratory puncture resulted in a flow of serous fluid. The cyst then collapsed, but filled again, so that another puncture was made with the same result; on this occasion the patient was told to return for further treatment if the tumour recurred, but as she did not do so I presume the fluid was not again secreted. In a second case of exactly the same description I was unable to obtain a cure, so that Mr. Duncan, at my request, dissected out the cyst after reflecting the upper lip. Voltolini seems to have met with quite a number of examples of cystic degeneration of simple mucous polypi, and whether the cases described by Johnson, Lefferts, Watson, and R. Horsley, were of this nature, it is difficult to say.

The *treatment* in the case of cysts forming projecting tumours is simple; they should be grasped with a forceps or snare, ruptured, and the cyst wall pulled away.

Osteomata or osseous tumours, having no direct attachment to bone, are sometimes met with in the nasal fossæ. Exostoses, too, occasionally project into the nostrils when they have their origin in the ethmoid or frontal regions.

In such cases treatment must be regulated by the size of the growth and the urgency of the case; an external operation, falling within the sphere of the general surgeon, will often be required.

Osseous cysts are sometimes met with in the nose, and the middle turbinated bone seems always to be the part involved. This bone is in reality a part of the ethmoid, and contains a pneumatic space. Sometimes this assumes very large proportions, as noted by Glasmacher, Schäffer, Heymann, Schmiegelow, and myself. Nasal obstruction and headache may be thus caused, and on examining the nose the middle turbinated body, on one or both sides, is seen to be enlarged, sometimes filling the entire lumen of the middle meatus anteriorly. So far the cases described have always occurred in women.

The *diagnosis* is founded on the hardness of the tumour, which, however, if firmly pressed upon, sometimes gives the sensation of parchment, and on exploratory puncture with the electric cautery or a carpenter's brogue, which gives access to a cavity.

After the diagnosis is made, part of the cyst wall should be removed with scissors or forceps.

Bayer has also described an example of multilocular osseous cyst presenting in the same situation, and probably also involving the body of the ethmoid, as exophthalmos was produced. In this instance the cavities contained some sticky yellow fluid.

Enchondromata seem sometimes to occur apart from the cartilaginous projections met with on the septum and before described. In a patient observed by Moldenhauer the growth arose from the floor of the left nostril, and caused not only nasal obstruction but deformity, and had to be removed by the aid of an external operation.

Malignant tumours.—As has been before stated simple polypi sometimes undergo malignant degeneration, and malignant growths may exist behind simple polypi. Such occurrences as these must, however, be looked upon as rare.

Both *sarcomata* and *carcinomata* are not unfrequently met with in the nasal cavities. The former are more common in young persons, while the latter are most frequently encountered in those who are past the prime of life, although I have seen cancer of the nares in a patient under thirty.

According to my experience sarcomata are most commonly met with springing from the septum, while in carcinoma the actual origin of the disease is usually uncertain; for, when the outer and upper walls are affected, we have no means of definitely ascertaining during life to what extent the adjacent bones are involved. Recently Newman has described a very interesting case of adenoid cancer affecting the inferior turbinated body. In malignant disease of the nose it is, I think, rare to have any marked glandular enlargement.

Nasal obstruction or epistaxis, often both, are the prominent *symptoms*. Pain is sometimes complained of, but is often absent. On examining with the speculum, a tumour is seen occluding or partially occluding the affected nostril. The appearance of the growth is usually sufficient to arouse the suspicion of the experienced rhinologist. Both varieties of malignant disease give rise to tumours which, as a rule, have no resemblance to either simple polypi or any of the other varieties of innocent neoplasm met with in this region. These tumours may resemble the nasal mucosa in colour, but they are often of a greyish or dusky red shade; in cases of melano-sarcoma, as described by Lincoln, Heymann, and Michael, the growth is, of course, black. Usually they are extremely friable, bleeding on the slightest touch; sometimes they are soft, but rather deficient in vascularity, as in a case of my own, where the patient used to procure for himself temporary relief by scraping out the adventitious tissue with the handle of a spoon without causing serious hæmorrhage.

The two forms of malignant disease I have met with may be briefly described as follows:—(1) A red or greyish neoplasm, springing from the roof or outer wall, and growing with considerable rapidity, and finally producing protrusion of the eyeball, and associated in its later stages with fœtid discharge; (2) A dusky red tumour growing from the septum and quickly recurring, unless removal has been complete, usually sarcomatous.

Both varieties commonly give rise to repeated hæmorrhages, and contact with a probe is usually enough to induce bleeding.

The *diagnosis* of malignant disease rests upon—(1) the clinical features, the most important of which are a tendency to bleed and ulcerate, great friability, and macroscopic characters unlike any variety of simple growth; (2) microscopic examination. The microscope is a useful aid to diagnosis, but it must be used only in association with the clinical features of each case. It is of the greatest importance to examine microscopically a fragment of any nasal tumour which, from its symptoms and naked eye characteristics, is considered suspicious. In the event, however, of the microscope giving indications of innocence while the clinical characters of the case point to malignancy, I am inclined to trust the latter rather than the former. Thus, in a young girl who complained of nasal obstruction and epistaxis, the right nostril was filled by a dusky red tumour of somewhat irregular outline and soft consistence, which had its origin from the septum. The whole was removed and examined by a pathological expert, who pronounced it a pure myxoma. The wound healed kindly, but in a very few weeks the growth had recurred, in spite of a removal so complete that not a vestige of the neoplasm seemed to remain. This second growth was removed, and the same expert pronounced it to be distinctly sarcomatous. I have had another similar experience in a case of carcinoma in which the fragment examined indicated only adenoma. On the other hand, to differentiate with certainty a sarcoma of the septum from a tubercular tumour without the aid of the microscope would be difficult, and, in the early stages, impossible. I do not therefore wish to underestimate the value of histological examination, but rather to insist upon its combination with clinical observation.

The *treatment* of malignant disease of the nose is most unsatisfactory. Voltolini recommended electrolysis and the internal administration of Zittmann's decoction, and gave a special recipe for its preparation. No doubt electrolysis may possibly be of some service in destroying the growth without risk of bleeding, but its curative effects are probably nil, or at all events inferior to total removal when practicable. Arsenic should be administered internally, and, in the case of cancer, Chian turpentine may be tried; but it is almost superfluous to say that internal remedies are rarely, if ever, useful.

For purposes of operative treatment, we may divide malignant disease into two varieties:—

(1) Cases in which the origin of the neoplasm cannot be made out by means of rhinoscopy. In these instances the superior maxilla or ethmoid bone is usually involved, and in many of them complete removal of the growth is impossible, even by external operation. Each case must, however, be judged on its merits.

(2) Cases in which the origin of the tumour is distinctly localised. This class of cases includes, according to my experience, only sarcomata of the septum. If situated anteriorly, they may be removed with the galvano-caustic snare, after which the point of attachment is thoroughly touched with a flat cautery. If the growth be further back, or so situated that free access cannot be obtained, an external operation becomes imperative, and the case passes from the domain of the specialist to that of the general surgeon. In estimating the possibility and method of complete removal, however, the rhinologist will, in many cases, be able to afford considerable assistance.

In this connection it is of the greatest consequence to employ posterior rhinoscopy, as in this way the posterior limit of the growth can be estimated more surely than by digital examination.

TUMOURS OF THE NASO-PHARYNX.

Adenoid Vegetations.—Adenoid vegetations are not tumours in the sense usually implied by this term. Normally there exists between the orifices of the Eustachian tubes an adenoid tissue analogous in structure to the lymphoid constituents of the tonsil, and often designated "third tonsil," "Luschka's tonsil," and "pharyngeal tonsil."

Hypertrophy of this adenoid cushion is very common in children; but, as a rule, spontaneous shrinking takes place soon after puberty. As we have already seen, the remnants of the enlarged pharyngeal tonsil may give rise to post-nasal catarrh, the secretion proceeding either from the whole surface, or being produced in the median recess. From recent observations it appears that the adenoid cushion is commonly divided antero-posteriorly in the middle line by a sulcus—the median recess of the naso-pharynx—and that, as a result of inflammatory changes, a more or less closed cavity may be formed. The localised catarrh arising from this cause has been already discussed. More rarely—when closure has been complete—a distinct cyst, occupying the vault of the naso-pharynx, may be formed.

Although hypertrophy of the pharyngeal tonsil is most common during childhood, yet it is sometimes met with in adults; so far, my oldest patient has been a lady of forty-six, in whom the hypertrophy was very marked.

The *symptoms* of adenoid vegetations vary according to the amount of hypertrophy and the size of the naso-pharynx. The patient usually keeps the mouth open, and thus acquires a stupid expression; snoring during sleep is common; the features are often sharp, and the palate arched. A constant tendency to catch cold exists, and the patients are often said to be absent-minded. Guye states that many children afflicted with adenoid vegetations are unable to fix their attention, and hence have difficulty in learning; a combination of symptoms which he ascribes to interference with the cerebral lymphatic circulation, and terms aprosexia. I suspect that this phenomenon is rare, and when it exists is due to co-existing middle ear catarrh, in connection with which similar symptoms were long since observed by Von Tröltsch. Interference with chest development, although it may occur, is by no means so frequent as some authorities infer. I have frequently met with impediments of speech and stammering in children who had adenoid hypertrophy, but whether the coincidence was accidental or not, I have been unable to determine. Articulation in well-marked cases is, however, distinctly nasal, *e.g.*, the word common tends to become "cobbod," as pointed out by Woakes.

Sometimes attacks of pseudo-croup seem to be due to the copious secretion—which is not uncommonly a prominent symptom—falling into the larynx. Occasionally complaints are made that the patient has constantly to use a pocket-handkerchief; while sometimes the child is stated not to be able "to blow the nose."

Deafness due to Eustachian obstruction, and sometimes to middle ear suppuration, is a very common symptom, and one which should always be looked for. In this connection, it is well to remember that adenoid tissue, enough to cause inflammation of the mucous lining of the Eustachian tubes, may exist without being in sufficient quantity to obstruct nasal respiration in the least. To repeat, the leading symptoms are nasal obstruction and deafness.

The *diagnosis* may often be arrived at, with almost absolute certainty, by a process of exclusion. If a child has distinct nasal obstruction, and the anterior nares are freely pervious, the case is probably one of adenoid vegetation. If posterior rhinoscopy be practised, one of the following appearances will be met with:—(1) A cushion of tissue, for the most part smooth, but furrowed here and there, projecting downwards from the vault, and concealing the upper part of the septum; (2) Irregular masses of tissue depending from the vault; The colour of the enlarged pharyngeal tonsil is similar to that of mucous membrane. Although the Eustachian orifices may be pressed upon from above, I have never seen them surrounded by adenoid hypertrophy—my experience thus being similar to that of Trautmann.

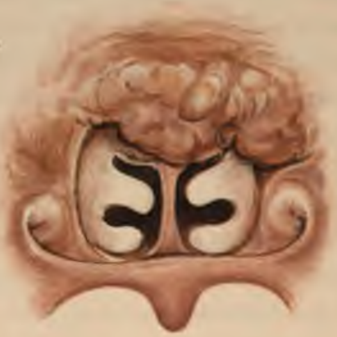

FIG. 23.—Adenoid vegetations partially removed.

In the *diagnosis* of adenoid vegetations, however, digital examination is superior to rhinoscopy. In slight cases the vault of the pharynx is felt to be occupied by unusually soft mucous membrane, bleeding readily, and having altogether a sensation of undue thickness and friability. In marked examples there is the same yielding, almost gelatinous, feeling, while the blocking of the cavity is, of course, more perceptible. In typical cases the finger — however gently the examination may have been conducted—is, on withdrawal, tinged with blood. Rarely, and then usually in patients nearly or quite grown up, the hypertrophied pharyngeal tonsil acquires considerable hardness, due to fibroid changes.

Sometimes the vegetations can be seen through the anterior nares; but I have usually found that undue turgescence of the inferior turbinated body exists, so that a previous application of cocain is necessary. Co-existing with adenoid vegetations, we often find enlargement of the tonsils proper, and very commonly the posterior wall of the pharynx is studded with lymphoid granules—a condition which, when seen in a child, should arouse suspicion as to the existence of adenoid hypertrophy.

The *etiology* of this affection is uncertain. Very often the first indications are noticed after a cold, or more particularly after one of the infectious diseases, *e.g.*, measles, whooping-cough, scarlatina, or diphtheria. Family predisposition certainly exists, as two or more patients from one household are frequently met with in practice.

Treatment must be adapted to the amount and importance of the symptoms produced. Thus, if slight nasal obstruction or hypersecretion alone exists, we may delay operative interference, and apply such treatment as has been advised for post-nasal catarrh, as the condition is not in itself serious, and more especially because in most cases there is, after puberty, a tendency to spontaneous disappearance of the hypertrophy. On the other hand, marked nasal obstruction and, most important of all, recurrent attacks of deafness or earache are indications that no time should be lost in removing the hypertrophied tissue.

The *modus operandi* must vary with the nature of the case. Only if the hypertrophy be very slight can we make much impression upon it by means of the finger-nail—a proceeding recommended by Cresswell Baber and Urban Pritchard. Some authors, *e.g.*, Lennox Browne, advise a curette attached to a finger-guard—a method which may, no doubt, be successful, but of which I have no experience. It must, however, be remembered that if the operator detaches tissue while his finger is still kept in the naso-pharynx, there must be great danger of the detached mass falling into the larynx, as the position of the surgeon's hand prevents the pharyngeal muscles from guiding the fragment into the œsophagus; on the other hand, no operation which does not remove most of the adenoid hypertrophy can be considered satisfactory. Sharp spoons (Justi and Trautmann), curettes cutting from side to side (Lange and Hartmann), and the electric cautery (Voltolini) are methods which, no doubt, have led to successful results in the hands of their respective advocates. Meyer, to whom is due the credit of first having pointed out the occurrence of adenoid vegetations, operates with a ring-shaped knife introduced through the anterior nares. The methods I adopt are categorically as follows:—

(1) Very slight cases—scraping with the finger in obstreperous patients, in others with Gottstein's curette.

(2) Medium cases—Gottstein's curette.

(3) Marked cases—Gottstein's curette and the finger nail, sometimes preceded by the employment of Woakes' or Kuhn's forceps.

These instruments have already been described, but, at the risk of repetition, a few words must be spent upon the operation.

Cocain may be employed, but, unfortunately, it is difficult to procure by its means satisfactory local anæsthesia, the explanation probably being that the drug never reaches the actual point at which the tissues are severed. In employing Gottstein's instrument it is of great importance to work in or near the middle line in an antero-posterior direction — the instrument being passed forwards to the septum before any pressure is made, and then pushed against the base of the skull and drawn backwards, care being taken to avoid the Eustachian orifices. The tissue which is severed is sometimes swallowed, but usually it is either expectorated, or comes out upon the instrument. The moment the curette is removed the patient's head is thrown forward to facilitate expectoration. Occasionally an almost detached portion of tissue remains hanging loose in the pharynx, and requires to be removed with dressing forceps.

In employing forceps the same care must be exercised to avoid the Eustachian orifices by working in the middle line. The uvula, too, is sometimes in the way, and it requires some little manipulation to avoid squeezing it. If the cutting blades of the forceps be pushed too far forward the septum may be seized, hence I prefer to attack such tissue as is in the immediate vicinity of the choanæ with the curette after the main mass has been removed. The beginner must remember that, while these forceps are furnished with cutting extremities, the removal of the portion seized is quite as much by traction as abscission.

Several sittings are often necessary if no anæsthetic be employed, and it is astonishing how comparatively readily most children submit to a second *séance*. I now generally operate under chloroform when practicable, and have recently found that the method recommended by Semon, viz., scraping with Gottstein's curette while the patient's head is hanging over the edge of the table, to prevent blood and fragments getting into the air passages, is extremely satisfactory. Where there is a great quantity of tissue it is sometimes well to remove the main mass by means of forceps, and then to employ the curette.

When anæsthesia is employed a gag is required, while the head should be near a window giving a good light.

Bleeding is comparatively slight where the operation is performed without chloroform, but, under anæsthesia, owing to the dependent position of the head, considerable hæmorrhage may occur. I have, however, never met with sufficient bleeding to justify alarm or require special treatment.

The operation is often followed by headache, and a certain amount of sore throat exists for a day or two, while occasionally middle ear catarrh results. The sore throat is much less marked, however, if the patient be made to eat ices immediately after the operation, or in hospital cases, where money is an object, to suck pieces of ice.

For some days afterwards it is desirable to avoid exposure to cold, and above all, to septic or contagious influences.

Fibro-mucous polypi.—These tumours are, as a matter of fact, fibromata—harder than mucous polypi of the anterior nares, and softer than the dreaded fibrous growths of the naso-pharynx.

In clinical characteristics the fibro-mucous polypus differs altogether from either of the forms just referred to.

In my experience it occurs more commonly in women than in men. Although it is sometimes associated with polypi in the anterior nares, it is usually single, and, when removed, does not show any great tendency to recur, although I have met with one exception to this rule. The growth is usually inserted by a thin pedicle near the margins of the choanæ.

The *symptoms* are by no means characteristic, comprising, as they do, nasal obstruction — often varying in intensity, and changing sides, owing to the mobility of the neoplasm —and interference with articulation, due to pressure on the palate. We need not dwell in detail upon the semeiology, as rhinoscopic examination will at once reveal the nature of the disease. By examination of the anterior nares a bluish mobile mass may be detected, but its true character can only be exposed by means of the mirror, unless it has grown to such a size as to be visible on inspection of the pharynx. A bluish globular mass is then seen occupying the naso-pharynx, and, on palpation, the tumour is felt to be freely moveable.

The *diagnosis* is comparatively easy, as the colour and mobility distinguish the fibro-mucous from the true fibrous tumour. From a cyst of the posterior extremity of the turbinated bodies it is differentiated by its greater mobility and the absence of fluctuation.

As has been stated, these tumours are almost invariably pedunculated, and the pedicle is commonly very thin. In one of my cases, however, in which the neoplasm sprang from the inferior turbinated body, the attachment was of considerable thickness. It is, therefore, of importance to estimate the probable thickness of the pedicle before deciding upon the method of removal.

The *prognosis* is favourable, as there is no great tendency to recurrence after removal, and when reproduction does take place a very considerable interval of freedom is always enjoyed. Moreover, these fibro-mucous polypi are sources of discomfort only, but not of danger.

The *treatment* in those cases where the growth has, as is usual, a slim pedicle is simple in principle, but sometimes difficult of execution. The method I generally adopt is to pass a loop of steel wire over the club-shaped extremity of the growth. If the latter be of such a size as to project below the palate a straight instrument may be employed; if, however, the neoplasm be concealed in the naso-pharynx, Jarvis' instrument with a bent extremity is most suitable. In the former case no difficulty is usually encountered. The wire is passed over the growth, far enough to secure a good hold, and then the mass is simply wrenched off. When the polypus does not project below the palate the wire must be guided over it by the aid of the mirror. The patient, taking charge of the tongue depressor, and the palate being held forward by White's self-retaining retractor, the operator uses the mirror with his left hand, and with his right guides the loop of steel wire over the polypus and pushes it up; the mirror is now abandoned, and the left hand employed to hold the snare, which is tightened with the right. Whenever a sufficient hold on the growth has been obtained it is wrenched out as before. Some operators prefer forceps, and, no doubt, evulsion by their means is equally satisfactory, and sometimes more simple than the adjustment of the wire. These cases sometimes tax to the utmost the surgeon's ingenuity. In one of my cases, after attempts with various instruments, the polypus was at last detached by means of traction with the finger. If it be desirable or necessary to pass the snare from the anterior nares, Schech's galvano-caustic snare, employed without the current, is useful, owing to its delicacy, associated, as it is, with considerable strength. It is threaded with steel wire, and the loop made as small as possible. In this way it is passed along the inferior meatus, and when the extremity has reached the naso-pharynx wire is paid out, and the loop, owing to the resilience of the steel, expands; the index fingers behind the palate will now enable an assistant to push the loop over the growth, and immediately this is accomplished the operator tightens the snare. In these pedunculated tumours I consider it of the greatest importance that the neoplasm should be wrenched off, as it is usually by this means only that we can remove it completely. If abscission, either by a cold or incandescent wire be attempted, a stump is likely to remain in a by no means easily accessible position, and its subsequent destruction with the electric cautery will entail much time and trouble.

When the pedicle is thick, however, we must resort to this method, and it is then best to employ the incandescent wire, which must, under these circumstances, be made to encircle, as nearly as possible, the point of attachment. Any portion of the pedicle left after this must be carefully treated with the electric cautery or chromic acid, if it be desired to prevent recurrence. In the case above-mentioned, in which the growth was attached by a broad base to the inferior turbinated body, I was inclined to look upon the neoplasm as an enormously developed hypertrophy of the posterior extremity, and therefore employed no after-treatment; that I was probably wrong is shown by the fact that recurrence has taken place.

As a rule, no after-treatment is required in the case of pedunculated growths, as, if evulsion be employed, every vestige of the tumour is usually removed. Bleeding is free at first, but ceases without requiring any special measures.

Fibrous tumours.—This dreaded form of neoplasm which, although histologically innocent, presents so many of the characters of malignancy, is fortunately rare. Naso-pharyngeal fibromata may spring from any part of the upper and posterior walls of the cavity, *i.e.*, from the base of the skull and anterior surface of the upper cervical vertebræ. They are commonly somewhat pedunculated, but the pedicle is of very considerable thickness; further, its attachment is to the periosteum and bone—not merely to the mucous membrane. In colour the tumours vary from a pale pink to a deep red, while they are firm and resistant to the touch. Sections examined under the microscope show firm fibrous tissues, round cells, and often dilated vessels. As the tumour increases in size it invades adjacent parts, insinuating itself into the choanæ, causing absorption of bone, and not unfrequently undergoing ulceration or forming fresh adhesions.

The *etiology* of these tumours presents many points of interest. With very few exceptions they have occurred in young males of between ten and twenty-five years of age, and Voltolini considered that their growth is intimately connected with the development of the skull.

The most prominent *symptoms* are bleeding and nasal obstruction in the early stage. As the tumour extends it may ulcerate at points, and thus give rise to fœtid discharge. During its period of growth the neoplasm enlarges in spite of, and at the expense of, opposing tissues. Thus by sending processes forwards it distends the nasal bones, producing the so-called "frog face." By its extension towards the orbit the eye may become involved, or, as more frequently happens, forced outwards, giving rise to exophthalmos. If increase occurs chiefly downwards and backwards, the growth projects into the throat, and deglutition, and even respiration, may become impeded. Sometimes extension occurs into the cranial cavity, resulting in cerebral symptoms, while in its later stages, the disease may cause, and often does cause, great pain from pressure on nerves, and deafness from implication of the Eustachian tubes. Death may result from exhaustion, hæmorrhage, pyæmia, cerebral complications, or a combination of these.

Rhinoscopic examination reveals a tumour of a pale or dark red colour. Palpation with the finger indicates the growth to be of firm consistence and not freely moveable. It is hardly necessary to add that, in advanced cases, examination of the nostrils with the speculum may show projections extending forwards. It is of the greatest importance to estimate, as exactly as possible, whether the growth has formed any adhesions or is lying free; for in the latter case it will be possible to surround it with a loop of wire.

The *diagnosis* is not difficult in well-marked cases, considering the sex and age of the patient; for fibro-mucous polypi occur chiefly in adult women, and are of a bluish colour, and freely moveable. At the same time, from clinical experience, I feel inclined to believe that there is a form of fibrous tumour of the naso-pharynx which occurs in young males, and which is of less serious significance than the typical variety which has been just described. In these cases the consistence of the growth is the same, but the attachment is by a very narrow pedicle; indeed, the tumour has the characters of a fibro-mucous polypus, which has undergone a further development of the fibrous elements. This question is, however, extremely difficult to discuss in a text-book, as we have not authentic records of any number of fibrous polypi in their earlier stages; and further, no specialist is likely to leave such a tumour as I have described *in situ* in order to observe whether it will, or will not, by contracting further adhesions, develop into the graver form; nor can we tell whether, in these growths with thin pedicles, the latter spring from the periosteum or not. Malignant tumours of this region are usually of much softer consistence—a remark which particularly applies to sarcomata, the only form liable to occur at the age when fibromata are met with.

The *prognosis* must be considered grave in all cases, and is probably worse the younger the age of the patient. It was pointed out by Legouest that, as these tumours are not met with after the age of thirty, there is probably a tendency to spontaneous absorption. Cases recorded by Gosselin and Lafonte tend to corroborate this view. Moreover, occasionally a spontaneous cure has been known to result from separation of the growth by sloughing.

The *treatment* of fibrous naso-pharyngeal tumours cannot be conducted in all cases on the same lines. Sometimes the specialist will have to call in the assistance of the surgeon in order to remove a growth which cannot be attacked except by external operation; although, should the electrolytic methods advocated by Voltolini and Michel fulfil the expectations of these authorities, such cases will become rare. Electrolysis apart, it appears to me that an external operation is indicated when the tumour, owing to its situation and attachments, cannot be encircled by a snare nor removed by evulsion. It is not my intention to discuss the various methods which have been employed by surgeons; but I cannot refrain from stating that, of such methods, that recently so successfully practised by Annandale—dissecting up the nose and dividing the superior maxilla in the middle line—is undoubtedly the best.

Turning now to treatment without external operation, we may, I think, dismiss caustics, injections into the substance of the tumour, and ligature as obsolete. Further, evulsion with strong forceps is usually only applicable to pedunculated neoplasms, although Hansberg has successfully treated a case in which the tumour was sessile by removing it piecemeal, with Kuhn's forceps, for adenoid vegetations.

The snare and electrolysis are the methods which chiefly deserve attention. Although Bosworth favours the cold wire, I cannot believe that its employment is as desirable as that of the incandescent loop. I have removed a fibrous growth with my écraseur snare and powerful wire, but in such cases I now always employ the electric cautery. It must be remembered that one of the great dangers is hæmorrhage, and this tendency is best obviated by operating with the snare at a dull red heat and cutting through the growth very slowly. I need not here repeat the method of introducing the wire, which should be similar to the plan adopted for fibro-mucous polypi. Macdonald advocates a somewhat ingenious device, which may be found valuable in some cases of either form of growth. A thread is passed through the nostrils and brought out at the mouth (as in plugging); to its buccal extremity are attached the two extremities of a piece of steel wire in such a way that the points are protected. The thread is then drawn up through the nose, and is of course followed by the wire, a loop of which is thus left in the naso-pharynx.

Electrolysis[1] has already been considered at some length, and need not be further discussed.

It is unnecessary to refer in detail to palliative treatment. The occurrence of severe bleeding may necessitate the employment of styptics, and fœtid discharge affords an indication for the use of antiseptics.

After removal of the main bulk of the tumour, it is most desirable that the patient should be examined again from time to time. Should any of the tumour be left, or should recurrence threaten, the part must be treated with the galvano-caustic point.

Enchondroma, exostoses, adenomata.—Cartilaginous tumours have been described by Müller and Heurtaux. In both cases external operations were required.

Exostoses sometimes arise from the vertebral column, and can be both seen and felt to project into the naso-pharynx. They rarely, if ever, grow to a size sufficient to make their presence of serious import. On the other hand they may prevent the free exit of secretions, and so keep up obstinate catarrh.

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[1] *See* General Therapeutics.

I have only seen one example of adenoma, and that was in a boy whom I examined in consultation with Dr. Mackenzie Johnston, who has published a description of the case. The tumour was hard, and attached by a broad base, so that Dr. Johnston removed it piecemeal with Woakes' forceps.

Malignant tumours.—Sarcomata and carcinomata occur—although rarely—in the naso-pharynx, where they give rise to symptoms of nasal obstruction, usually associated with hæmorrhage. In both varieties the cervical glands may be enlarged, but this occurs at a much earlier period in carcinomata. Ulceration, too, is prone to occur, and fœtid pus then finds its way into the mouth and nose. Earache and deafness may also be present, and if the patient survives long enough, the latter is sure to supervene. In doubtful tumours it is always well to remove a fragment for microscopic examination, and diagnosis is often assured by this method.

A broad based neoplasm, attached to the vault of the naso-pharynx, associated with a history of repeated hæmorrhage, in a patient over thirty years of age, is probably malignant. If, in addition, the cervical glands be enlarged, this probability is much increased. The appearance of malignant growths in the naso-pharynx varies considerably, and the same is true of their consistence, but palpation with the finger usually reveals the want of definition so characteristic of malignancy.

The *diagnosis* is not, as a rule, difficult, if certain facts be borne in mind. I have never met with nor read of a case of gumma in the naso-pharynx simulating malignant disease. Carcinoma is unlikely to occur under thirty, and, as a matter of fact, the youngest patient mentioned by Bosworth in his valuable compilation of recorded cases, was thirty-seven years of age. It will thus be evident that cancer cannot be confounded with the only other condition at all resembling it, to wit—

fibroma. Sarcoma may occur in young persons. Bosworth has collected nineteen examples, and of these ten occurred in patients under thirty. If it be remembered that sarcomata are usually much softer than fibromata diagnosis will be comparatively easy. I have never met with malignant disease of the naso-pharynx in childhood, but I can quite believe that sarcoma might, in its early stages, be mistaken for adenoid vegetations.

I have once observed epithelioma originating in the naso-pharynx. The first symptom complained of was pain in the ears and throat — a year before examination (March 1888). These symptoms abated, only to return with renewed force in August, at which time inspection of the throat by a relative revealed no abnormality. There was a history of occasional expectoration of blood. On examination (March 1889) a warty ulcerating mass was visible behind the right tonsil, and on tracing this upwards it was seen to extend over the vault of the naso-pharynx, beyond the middle line, and also to some extent to involve the soft palate, while the glands on the right side of the neck were markedly infiltrated.

The *prognosis* of all forms of malignant disease is bad, but probably it is relatively better in sarcoma than in carcinoma.

Removal of the tumour, where practicable, should be practised, and the base thoroughly cauterised. Whether this is to be done by means of the galvano-caustic snare, or with the aid of external operation, must be determined by the surgeon after careful examination and consideration. It must be remembered, however, that while the removal of the tumour by means of the galvanic cautery can rarely cure, it at all events palliates the discomfort for a time, without causing any great danger. The same cannot be said of such procedures as are required to gain access to the naso-pharynx from without. Annandale's operation may perhaps prove an exception, but so far as I am aware it has not been practised for malignant disease, and it is, moreover, doubtful whether at an advanced age the two segments of the upper jaw could be forcibly separated. The melancholy fact remains that the victims of malignant disease of the naso-pharynx may usually be considered doomed. Palliatives, such as antiseptic sprays and douches, opiates, plugging, and styptics, may be called for as the case progresses. Arsenic and other tonics may be given, or Chian turpentine may be tried.

CHAPTER IX.

VARIOUS CONDITIONS.

FOREIGN BODIES.

CHILDREN in play, and lunatics, occasionally introduce into the nostrils such things as peas, beans, locust seeds, buttons, pebbles, and nails. It would but weary the reader to recapitulate in detail all the various substances which by childish ingenuity have been introduced into the nasal passages. More rarely the act of vomiting is responsible for the presence of extraneous bodies, which will then be found in the posterior parts of the nasal passages.

If the case be recent, the diagnosis is usually made by the relatives, and inspection with the speculum reveals the presence of the offending mass. On the other hand, it may happen that the patient does not communicate the fact of having put anything into the nose at the time of the accident. A unilateral nasal discharge, which soon becomes purulent and fœtid, then results. If the foreign body be a pea or bean it swells up, and, in any case, nasal obstruction is more or less marked. A unilateral offensive discharge, especially when it occurs in a child, is a symptom which should lead to the suspicion of a foreign body. Under these circumstances it is always well to syringe, or, better still, spray the nostril with boracic lotion and then examine carefully with the speculum. Even then the extraneous substance may not be visible, owing to its being embedded in granulations, but a probe carefully introduced will usually enable the diagnosis to be made. The only possible error is to mistake the foreign substance for a sequestrum or rhinolith; this will, however, have no evil consequences, as removal of the mass is indicated in any case.

The *treatment* is by no means difficult, as it is rarely that we find the foreign body very firmly wedged in the nasal passages. Such expedients as the administration of snuff, blowing the nose, and the injection of air with Politzer's bag into the opposite nostril are not efficient, but neither are they hurtful. The same cannot be said of syringing fluids into the opposite nostril, for, as the other passage is usually more or less stenosed, the liquid is likely to find its way into the tympana and to set up inflammation of the middle ear.

In endeavouring to remove the foreign body, great care must be taken not to push it backwards. I have found a very delicate blunt hook—such as is used for the ear—most serviceable. This is slipped past the mass, and then rotated so as to enable the operator to exert traction. Should the power so obtained be insufficient, dressing forceps must be resorted to, guided as far as possible by illumination, while some authorities employ a snare. Should a foreign body be lodged in the choanæ, it may be necessary to push it back into the naso-pharynx; a proceeding which, if carried out with one finger behind the palate, is probably both safe and simple. I have not, however, required to resort to this manœuvre in any of my cases. Indeed, the removal of foreign bodies is, in my experience, extremely easy. Should a difficult case be encountered, it has seemed to me that an efficient instrument might be constructed on the principle of the expanding œsophageal probang.

Rhinoliths, or Nasal Calculi.

Rhinoliths are composed chiefly of carbonate and phosphate of lime. As a rule these mineral salts accumulate round a nucleus, which may be represented by a foreign body, a fragment of dead bone, or a blood clot. Examples have, however, been recorded where no such nucleus was discoverable. These concretions vary in size and shape, and present symptoms exactly analogous to those caused by a foreign body—from which, indeed, it is, before extraction, rarely possible to distinguish them.

The *treatment*, too, must be the same—extraction. It must, however, be remembered that these calculi may attain such a size as to make extraction *en masse* impossible. The rhinolith must then be broken up either with forceps or, if these fail, by means of a lithotrite. I have even seen, in consultation with Mr. Miller, a calculus which had to be extracted by external operation.

FUNGI AND PARASITES IN THE NOSE.

The öidium albicans is occasionally, although rarely, met with in the nose, while Schubert and Virchow have described examples of aspergillus found in the same situation. Ascarides have also been met with; and occasionally leeches, centipedes, and earwigs, have gained access to the nasal cavities.

Epistaxis, headache, sneezing, lachrymation, nasal discharge, and stenosis are the symptoms to be expected if a living creature of any size has entered the nasal chambers. In tropical climates such as India, South America, and Mexico—very rarely in European countries—flies deposit their ova within the nose, and maggots result. In the tropics, the disease so produced is known as "Peenash," and the ova which cause it seem generally to be those of the *Lucilia Hominivora.*

The *symptoms* of Peenash are, to begin with, slight, consisting of sneezing and tickling. At first a serous discharge is present, but this soon becomes purulent, and epistaxis is common. According to Morell Mackenzie, œdema of the face and eyes is a characteristic symptom, and occasionally localised swellings, followed by the escape of maggots, occur on the outside of the nose. Pain is intense, especially over the frontal region, and maggots are occasionally expelled from the nose. Ulceration, followed by caries, and not unfrequently terminating in death from cerebral complications, is met with as the disease progresses.

The severity of the symptoms and the gravity of the results is not to be wondered at, considering the fact that several hundreds of maggots may be present in the nose of the same patient.

It is questionable whether this disease often occurs in a perfectly healthy nose, as a certain amount of fœtor is probably necessary to attract the fly.

The *diagnosis* depends upon the presence of maggots, as evidenced either by their occasional expulsion or by seeing them within the nasal cavity.

The *treatment* must be directed towards killing the parasites, as these creatures cannot be removed by syringing or douching, owing to their clinging tenaciously to the tissues by means of the hooklets with which they are provided. According to Morell Mackenzie, this is best accomplished by injecting equal parts of chloroform and water—or, if necessary, pure chloroform—while the patient is anæsthetised. Turpentine, alcohol, infusion of tobacco, and various other remedies have also been recommended.

EPISTAXIS.

Bleeding from the nose may result from injury, nasal tumours, or ulcers. It may be due to congestion, whether caused by disease of the lungs, heart, liver, and kidneys, or existing as part of a general plethoric condition. Epistaxis is also met with in acute fevers, such as scarlatina, measles, diphtheria, and typhoid. It may occur in morbid conditions of the blood, as exemplified by anæmia, scurvy, and purpura, while occasionally it is vicarious, replacing a menstrual or hæmorrhoidal flux. That a tendency to bleeding from the nose is sometimes hereditary is proved by a series of remarkable cases occurring in the same family, observed by Babington.

In numerous instances of nose-bleeding the affection is due to purely local causes, and we now know, owing to the observations of Little, Michel, Hartmann, and Kiesselbach, that the bleeding point is usually situated on the lower and anterior part of the septum.

It would be superfluous to say anything as to the semeiology of an affection which is so well known, and which has, in some form or other, been experienced by most persons.

Turning now to *treatment*, the first question which meets us is, Should the bleeding be stopped? If the loss of blood be not such as to threaten serious results, and if, moreover, there be in a given case a history of feeling better after nose-bleeding, it is probably better not to interfere. The same applies to cases where epistaxis is vicarious or the result of congestion. In some of these instances, however, general treatment directed to the cause may be successful in checking nature's call for depletion. In anæmic patients, iron, and fresh air, are, of course, indicated.

When called to a case of nose-bleeding, the surgeon will, therefore, first decide whether it is desirable to stop the epistaxis. When this has been answered in the affirmative, the question arises as to the method to be employed. As before stated, the actual bleeding point is usually situated on the anterior and lower part of the septum. Frequently, therefore, compressing the alæ nasi between the finger and thumb will be sufficient, or a plug of lint, saturated with some oily and antiseptic substance (*e.g.*, oil of vaseline containing a little carbolic acid), may be inserted into the nostril. If this fails to arrest the hæmorrhage, the posterior nares should be plugged,[1] employing for this purpose a soft rubber catheter. If this instrument be not at hand, a wax-taper, or even a string soaked in gum and allowed to dry, will enable the operator to pass the twine through the nasal chambers.

Of course, I am aware that various astringents, such as solutions of perchloride of iron, tannin, alum, lemon juice, and even turpentine have been employed, but it has always appeared to me that plugging either the anterior or posterior nares, or, if necessary, both, is a more rational means of treating cases where it is of real importance that the bleeding should be immediately checked. Under the names of rhineurynter and rhinobyon various forms of bladders have been advocated; these are introduced into the nares, and then distended with air or water, but have no advantages over the simple methods of plugging. Verneuil advocates the employment of blisters over the hepatic region in epistaxis; but probably the class of cases amenable to this mode of treatment would derive more benefit from a course of Carlsbad or Marienbad waters. Internal astringents, such as ergot, are also employed; but the same objections to their use, which have been urged by Samuel West against their employment in pulmonary hæmoptysis, exist.

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[1] For exact method, *see* General Therapeutics.

In habitual nose bleeders it is of the utmost importance to find the bleeding point. Occasionally this is discovered on one of the turbinated bodies, but—as before stated—in the vast majority of cases, the lower and anterior portion of the septum is at fault. If the case be examined during or just after an attack, the site of the hæmorrhage can be localised by the presence of fluid or clotted blood. During the intervals a limited area of dilated vessels is occasionally, although in my experience rarely, seen, while sometimes—as pointed out more particularly by Ruault—a small crust or scab is found. More common than either, is a sodden appearance of the mucosa, presenting a whitish tinge as if due to maceration of the epithelium; and if this area be gently stroked, bleeding at once occurs. At the same time we sometimes see the vessels immediately surrounding the nostril dilated. Our efforts must be directed towards local treatment of this hæmorrhagic septal area. After applying cocain, by gently pressing a piece of absorbent wool saturated in a 20 p.c. solution against the septum, the latter is gently stroked with a flat galvano-caustic burner. Whenever bleeding begins, the current—which must only produce a dull red heat—is turned on and the area cauterised. In executing this manœuvre it is very important to keep up the connection until the platinum point is taken away from the cauterised area, otherwise it sticks, and the act of tearing it away sets up renewed bleeding. Ruault believes that the formation of crusts tends to keep up bleeding, and states that many cases can be cured by regularly spraying the nostrils with fluid vaseline. In view of the satisfactory results I have obtained from the cautery, I have not given this method sufficient trial to enable me to express any opinion. It is only necessary to add that when the electric cautery is not at hand, chromic acid, and even nitrate of silver, may be employed, although their action is probably less certain.

PERFORATION OF THE SEPTUM.

We have already seen that perforation of the nasal septum may occur in a variety of diseases, such as syphilis, tuberculosis, occasionally in typhoid and other fevers, and from exposure to chemical irritants, such as chromic and hydrochloric acids and arsenic. Further, it sometimes happens that in a patient who presents this peculiarity there is a history of an injury; in such instances abscess formation due to perichondritis has probably occurred at some prior date.

In a number of cases, however, none of the causes mentioned here, or in other parts of this work, are to be discovered. In these instances the perforation is always confined to the cartilaginous portion of the septum, and often gives no trouble. Indeed, I have frequently discovered the condition in the course of routine examination of the nose in cases of middle ear catarrh. Jonathan Hutchinson ascribes such perforations to picking the nose, and this view is to some extent borne out by recent observations on perforated septum in cement workers. Voltolini is inclined to consider the affection as one *sui generis*, analogous to perforating ulcer of the foot.

Bosworth states somewhat dogmatically that the perforation is always preceded by a projection which collects dust, and other irritants, and which finally leads to ulceration. Symptoms may be entirely absent, or the patient may complain of crusts in the nose and bleeding; while the perforation on examination may be found to be small, or may extend so as to involve nearly the whole cartilage. In this affection falling in of the nose does not seem to occur. In the case of a medical student whom I had under my care, the cartilage was deficient from just within the nostrils—almost if not quite—to the dorsum of the nose. In this patient the tip of the nose was a little lowered but no deformity could be said to exist.

Voltolini recommends touching the margins of the perforation with the galvanic cautery, and seems to have had excellent results. Keeping the parts free from crusts has appeared to me the best treatment for cases where the orifice is too large to admit of hope of closing it by Voltolini's method. Where there are no symptoms it is not desirable to interfere with a condition which is perfectly harmless.

NASAL HYDRORRHŒA.

Under this name Bosworth describes an affection characterised by a constant or intermittent flow of serous fluid from the nose. This author has been at great pains to collect in detail all the published cases of this rare condition. It would appear from a study of these that the affection sometimes follows an injury, and is then probably due to escape of cerebro-spinal fluid into the nose. Then, again, cases are related—one observed by Bosworth himself—where the affection was associated with the presence of polypi, which in his case he looked upon as an effect, and not the cause of the watery discharge. An instance recorded by Althaus is given at length, in which exposure to a cold wind caused symptoms pointing to involvement of the fifth nerves on both sides, and in which there was a profuse nasal discharge. Cases have also been recorded where inflammation or atrophy of the optic nerve co-existed with profuse nasal discharge. In some of these there was evidence of chronic hydrocephalus, and in others headache was relieved by the nasal discharge. Certain authors are, therefore, inclined to ascribe the hydrorrhœa to a flow of cerebro-spinal fluid, but, in view of the difficulty of procuring quantities of normal nasal serum for comparison, I do not see how it is possible definitely to decide this question at present. Profuse serous discharge is also an occasional symptom of nasal polypi and hypertrophic rhinitis, but in these instances the fluid is rarely in sufficient quantity to flow from the nostril. From my own experience of these cases I am inclined to think that in many instances the actual source of the serous flow will defy elucidation.

In one patient—a young man—who, if I remember right, had had epilepsy, and was found to have atrophic changes in both discs, and whose head was of the hydrocephalic type, a profuse serous flow occurred from the nose whenever he stooped and strained, as in lifting a weight. Removal of some carious teeth materially relieved, if it did not entirely cure this patient, who, unfortunately, disappeared somewhat suddenly from my clinic. In his case, at all events, I felt inclined to ascribe the hypersecretion to a reflex neurosis of the fifth nerve.

The *treatment* must depend upon the opinion of the physician as to the cause.

Before seeking remote causes, any abnormality of the nose which might give rise to the symptom in question should receive attention. Next, any possible source of irritation of the fifth nerve must be considered, *e.g.*, carious teeth, central changes, malaria, and the like. Should neurasthenia, or, indeed, any form of constitutional debility be present, this must be treated on general principles, but, in view of the obscurity which surrounds the etiology of these rare cases, it would be unscientific to dogmatise as to treatment.

When the hydrorrhœa follows a direct injury, and where the probable source of the discharge is the arachnoid cavity, great care must be taken to avoid exposure to septic influences.

CHAPTER X.

NEUROSES OF THE NOSE.

NEUROSES, DUE TO GENERAL NEURASTHENIA, OR TO A NEUROTIC HABIT.

Simple Erectile Swelling.—As I have several times previously mentioned, the nasal mucosa contains erectile tissue, most marked in the inferior turbinated body, but existing also in the middle turbinated region, and probably occurring in the tubercle of the septum.

In persons who are the victims of nerve exhaustion or neurasthenia, and in those who have either inherited or acquired a neurotic habit, erection of these parts—more especially of the inferior turbinated body—is prone to occur. This is more particularly the case if such individuals happen to suffer from slight hypertrophic catarrh, anomalies of the septum, or other causes of nasal obstruction, such as have been already discussed. Indeed, there can be little doubt that, as has been already mentioned, much of the obstruction in all these conditions is due to erection of tissue. The cases, however, which can be legitimately discussed here, are those in which the nasal lesion is in itself insufficient to cause inconvenience to a person of normal sensibility. Then, again, every experienced rhinologist has met with patients in whose noses even the most captious critic would fail to discover any abnormality, and who yet complain of periodic "stuffiness of the nostrils." The obstruction, be it observed, does not exist constantly, but comes and goes, being usually most marked—if the patient be a female—at the menstrual period. Sometimes one nostril, sometimes the other, is affected, and not unfrequently the discomfort is only, or chiefly, noticed on going to bed. The class of persons who suffer most frequently in this way are—(1) men, usually young, who are undergoing hard brain work, or are of very neurotic temperament; (2) young women of the neurasthenic type. Although to those in robust health transitory nasal obstruction seems a very minor inconvenience, it is noteworthy that patients who consult the physician for erectile swelling are usually loud in their complaints—a fact due, undoubtedly, to the nervous condition which lies at the root of the affection.

The *diagnosis* is not difficult. Sometimes the patient is examined when the erectile swelling is not present; the history of transient and varying nasal obstruction in the absence of any organic change in the interior of the nose, to account for this, is usually sufficient to establish a diagnosis. If, on the other hand, the nose be obstructed at the time, the physician must distinguish between erectile swelling and hypertrophic catarrh. The inferior turbinated body is seen to be much enlarged, but is readily pushed aside with a probe, while the application of a 10-20 p.c. solution of cocain causes it to collapse, and thereafter the appearance observed by the speculum is that of a normal nasal cavity.

The *treatment* must vary with the case. If there be present any slight abnormality, such as a small degree of hypertrophic catarrh, it is probably best to advise the use of an alkaline wash or spray. In all cases it is desirable, if possible, to remove so far as lies in our power, the irritable condition of the nervous system. It is hardly necessary to state that in women abnormalities connected with the generative system must be attended to. Anæmia, too, must be combated with iron, arsenic, and fresh air, while neurasthenia indicates rest of mind and body, together with a highly nutritious diet. Nervine tonics, such as quinine, or better, valerianate of zinc, are often useful, while occasionally the bromides may prove serviceable. The experienced practitioner, however, knows that the neurotic temperament when it exists often baffles all his efforts. In such cases more active local treatment is required in order to relieve the attacks of nasal obstruction, and in the electric cautery we have at our command a means of destroying the erectile tissue. In obstinate cases it is best to produce a slough of considerable size on the inferior turbinated body; as a result a scar forms and tends to bind down the tissue. Some authorities prefer to use a pointed platinum burner, and to introduce this into the substance of the inferior turbinated mucosa, where it is moved about so as to produce considerable destruction of submucous tissue. I have occasionally adopted this method with good results; but it has always appeared to me that it might be followed by suppuration and tension. I therefore, as a rule, prefer to apply a flat burner to the surface, and thus—as before said—cause an external slough.

Hay fever and allied conditions.—In certain cases, after the application of an irritant to the nostrils in persons specially predisposed by a nervous temperament, the mucosa of the nose suddenly swells, discharges serous secretion, causes sneezing and lachrymation, while not unfrequently these paroxysms are succeeded by or associated with bronchial asthma. Perhaps the most scientifically correct name for this class of cases is "vasomotor coryza," and certainly the best known form of it is hay fever.

This troublesome affection attacks predisposed individuals in this country during May and June, and the investigations of Blackley clearly point to the pollen of grasses as the common exciting cause. The disease is most frequently met with in men, and is almostly entirely confined to the cultured classes; it is also more common in the Anglo-Saxon races, and probably the Americans are the greatest sufferers among these. Certain authors, such as Daly and Roe, are of opinion that the victims of hay fever always present some pathological condition of the nose, but this is certainly by no means invariably the case. At the same time I have no doubt that nasal catarrh often acts as a predisposing cause, inasmuch as it is self-evident that an inflamed mucosa is often more irritable than the same tissue in a normal condition. It is, therefore, manifest that in an individual who is to a certain extent predisposed, nasal disease may be the actual exciting cause. With regard to the nature of this predisposition, recent observations seem clearly to indicate that the nervous system is at fault, and Sajous has been able to show that heredity plays an important part, for in 35 p. c. of his cases near relatives were similarly affected, and in 42 p. c. the patients had asthmatic relations. The pathology of hay fever does not lend itself to exact methods of observation, as the disease is never fatal. From the rapidity of its advent, however, we may deduce that on contact of the irritant with the nasal mucosa, the latter, by virtue of its erectile tissue, becomes suddenly congested to such an extent as to produce a serous flow. The usual course of the malady is somewhat as follows:—The victim, about the end of May or beginning of June, suddenly suffers from nasal obstruction, followed by serous discharge; at the same time occur much sneezing, itching in the eyes, lachrymation, and all the symptoms of a violent cold in the head; indeed, the condition might easily be mistaken for this, only that the initial chill and the constitutional symptoms are absent. Paroxysmal asthma is a comparatively common concomitant, and both this and the nasal affection may persist all through the summer months. A very interesting and curious case has been described by J. N. Mackenzie, in which an inflammation of the external auditory meatus, in all respects analogous to that of the nose in hay fever, occurred repeatedly in a lady during the summer months.

Autumn catarrh is a name which is correctly applicable to hay fever on the other side of the Atlantic, where the victims usually begin to suffer about the end of August. As shown by Wyman, this is probably due to the fact that the pollen of ragweed is the most virulent irritant, and this grass fructifies in autumn.

Rose fever is a term used to designate a condition analogous in all respects to ordinary hay fever, but in which the emanations from the rose are the exciting cause. Certain persons are also similarly affected by peaches, violets, and mignonette; others by aromatic substances, *e.g.*, musk and peppermint; by the emanations of animals, *e.g.*, cats, dogs, horses; by irritating particles, such as dust, ipecacuan, lycopodium, digitalis, salycilic acid, and the like. Sometimes, too, atmospheric conditions produce the same result, as in the case of a gentleman who was under my care, and who suffered from attacks similar to hay fever during the winter months. In this case the exciting cause could be traced to a condition of the atmosphere associated with hoar frost.

Before turning to a consideration of *treatment*, it is necessary to remind the reader that interference, whether therapeutic or surgical, must, to a great extent, be guided by the frequency of exposure to the exciting cause. Thus the individual who suffers only when brought in contact with such medicinal agents as lycopodium, ipecacuan, and the like, requires no medication, as avoidance of the exciting cause is simple, unless, indeed, the patient's duties bring him in contact with those substances. On the other hand, true hay fever is important, because during early summer all rural districts have an atmosphere laden with the irritant pollen.

The treatment of this affection must at present be considered *sub judice*. At the same time there are certain general principles which must guide the practitioner.

Evidently the most desirable means of combating an affection, which is known to depend upon a neurotic condition, would be by the administration of drugs calculated to act upon the nervous system. Thus nervine tonics are advocated by most authorities, and the actual medicament must be administered according to general indications. Anæmic persons are fit subjects for the exhibition of arsenic and iron, while for those who show no special peculiarity, such drugs as quinine, antipyrin, belladonna, and valerianate of zinc may be prescribed; and I am inclined to give preference to the last of these. The bromides, and iodides, seem to have no very definite effect, although the latter may prove useful in hay fever complicated with asthma. Where this complication exists, it should be treated on the same lines as the idiopathic variety. General hygiene, too, should be attended to, and, in addition to exercise, fresh air, and baths, Bosworth specially recommends cold spinal douches. I have only named a few of the multitudinous remedies and methods which have been advised for removal of the neurotic predisposition which lies at the root of hay fever, because I have grave doubts whether their success can be attested by even a small proportion of patients for whom they have been advised.

By honest observers it must be admitted that general treatment is only of very small utility, and the next question that arises is, "What line of treatment is likely to prove of real value?"

If the patient be in a position to go for a sea voyage during the early summer months, he is likely in this way to enjoy immunity. Seaside resorts, too, are less tainted with pollen than inland localities, while towns enjoy a comparative immunity. Even in the country the victim of this distressing complaint may remain without much local discomfort if he be content to spend most of his time indoors, and only to venture out with his nostrils plugged by cotton wool, and his eyes protected by close-fitting coloured goggles. I have been consulted by numerous patients for hay fever, but cannot recall an instance where this line of treatment had been adopted; for, indeed, such a cure is worse than the disease.

Although those authors who believe that hay fever is always associated with some abnormal condition of the nose are, in my opinion, mistaken, yet there can be no doubt that treatment directed to this part affords the best prospect of ameliorating the troubles of the patient.

If there be any marked morbid condition, this should certainly be treated. Thus a spur projecting from the septum or nasal polypi should be removed, while the ordinary treatment should be adopted for hypertrophic catarrh. Such cases, however, apart, I believe that when we have failed to subdue the general nervous irritability which is the primary cause of the disease, we are justified in taking such steps as are likely to diminish the local irritability which is the direct factor. With this object in view, various methods have been practised. Speaking roughly, these have for their object the hardening of the mucous surface in the sense of making it less irritable. This may sometimes be accomplished by simple means; thus, Greville Macdonald has seen occasional good results from the employment of a spray of chromic acid ($\frac{1}{16}-\frac{1}{8}$ gr. ad. ℥i.), while in one instance I procured relief for a patient during a whole summer by directing her to paint the interior of the nostrils with a solution of nitrate of silver (gr. 20 ad. ℥i.).

The treatment recommended by Sir Andrew Clark,—which consists in the application of glycerine of carbolic acid with small quantities of quinine (ʒi. ad ℥i.) and corrosive sublimate ($\frac{1}{1000}$ pt.) to the nasal mucosa,—no doubt owes its success to the paralysing properties of phenol; and probably the same is true of the advertised remedy known as the "Carbolic Puff-ball."

If we have once made up our minds that the best treatment is to paralyse the nerve endings in the nasal mucosa, the most effective means of doing so is afforded by the electric cautery, or, if this be not at hand, chromic acid. As a result of clinical experience I would say that the application of the cautery to the anterior portion of the inferior turbinated body is most often followed by satisfactory results. At the same time, there can be no doubt that the proceeding recommended by Sajous is the most scientific method of finding out which region ought to be cauterised. When, in a hay fever patient, touching any point of the nasal mucosa—whether on the septum or turbinated bodies—produces irritation, a tendency to sneeze, burning, and lachrymation, such a spot should be cauterised. This author recommends that the whole interior of the nose should be gone over in this way in from five to fifteen sittings; he, moreover, points out that there often exists a sensitive area anteriorly, where the septum meets the nasal cartilages. While I am in no sense sanguine about the results of this line of treatment, it seems to be the most likely to give relief. At the same time it must be admitted that "bad is the best," and I never submit any patient to it without first explaining the uncertainty as to a satisfactory result. From my own experience I should say that in this way amelioration can often be attained, but that absolute cures are rare. It does not seem to matter whether the treatment be adopted during the hay fever season or not, although, all things considered, it is probably better to apply the cautery a month or so before the period of the expected attack.

It only remains for us to discuss palliatives, which may be employed during the paroxysms. A spray of cocain no doubt gives marked relief at first, but it is notorious that this drug rapidly loses its effect, and the dose has to be increased. For this reason I am strongly opposed to the practice of recommending cocain for home use, more especially in the case of nervous individuals, lest they should become addicted to the employment of the drug for its stimulating effects. Menthol (10-20 p. c.) in olive oil may be applied either as a spray or with a brush. Carbolic acid in fluid vaseline (gr. 5 ad. ℥i.) may also be used in the same manner. Soothing remedies, such as inhalations of benzoin (ʒi. of the compound tincture to a pint of hot water) and chloride of ammonium have been recommended, while with the same object I have ordered a nasal spray of simple vaseline oil. As before stated the asthma must be treated on the same lines which are applicable to the idiopathic variety.

AFFECTIONS OF THE FIFTH NERVE, INVOLVING THE NOSE.

Of these there is little to be said. Anæsthesia of the nasal mucosa is extremely uncommon, and is said by Schech, when it occurs, to be due to cerebral tumours, endocranial syphilitic affections, or aggravated hysteria. Hyperæsthesia, on the other hand, is common, and probably forms the basis of hay fever and allied conditions. Neuralgia is rarely confined to the nasal branches of the trigeminus, but I have met with it once or twice. General constitutional treatment, with the addition of such remedies as arsenic, quinine, antipyrin, and exalgine is the line of treatment which most commends itself.

AFFECTIONS OF THE OLFACTORY NERVE.

Anosmia, or loss of smell.—In testing the sense of smell strictly odoriferous substances must be employed, such as peppermint, musk, and assafœtida, while, if very accurate observations be desired, the olfactometer of Zwaardemaker may be utilised. It is of great importance in such tests to exclude substances which act alike upon the olfactory and fifth nerves, such as ammonia and acetic acid, because their employment is liable to lead to confusion between purely sensory and olfactory impressions. As to the symptoms, it is only necessary to remind the reader that persons who have lost the sense of smell are often under the impression that they have also lost taste, as they can no longer appreciate flavour, although perfectly able to distinguish salt, acid, bitter, and sweet substances. Loss of smell may be bilateral or unilateral. All cases of anosmia are, however, not due to lesions of the olfactory nerve; indeed, the majority depend upon abnormal states of the mucous membrane, such as hypertrophic catarrh and polypi. It would, however appear that long continued anosmia from peripheral causes is prone to be followed by organic changes in the nerve itself. Thus Morell Mackenzie states that he has never known recovery take place where the loss of smell has lasted for two years or more. As causes of anosmia from disease of the olfactory nerves or centres may be mentioned congenital defects, injuries of the head leading to lesions of the olfactory bulbs, prolonged exposure to pungent odours, tumours, or inflammatory changes in the anterior cranial fossa, old-standing disease of the fifth nerve, atrophy (sometimes observed in old age), embolism of the middle cerebral artery, and hysteria. In locomotor ataxia loss of smell has been observed, and also in cases of tumours remote from the anterior fossa, *e.g.*, the cerebellum. The employment of nasal douches containing alum, sulphate of zinc, and carbolic acid, has been followed by persistent anosmia, while in facial paralysis the sense of smell may be impaired owing to inability on the part of the patient to sniff. Intermittent anosmia, associated with malaria, has also been described.

The *prognosis* must be guided by the cause of the affection, and also, as above mentioned, by its duration.

Treatment, too, must be based upon etiology. Hypertrophic catarrh, or other nasal lesion, may demand active interference, but from a consideration of the pathological conditions which have been enumerated, it will be obvious to the reader that frequently little can be expected from therapeutics. Hysterical, distinctly syphilitic cases, and those in which there is a history of malaria associated with intermissions, may, of course, be treated with a fair prospect of success. In the other forms it is the fashion of authors to recommend insufflations of strychnia ($\frac{1}{24}$ gr. with sugar), and hypodermic injections of the same drug. Electricity has been tried, but its application is extremely painful, and of doubtful utility.

Hyperæsthesia of the olfactory nerve is occasionally met with in hysteria, and the sense of smell is said to be sometimes developed to an extraordinary extent among savages.

Paræsthesia of the olfactory nerve—also known as parosmia—is the term applied to subjective sensations of smell. It is obvious that many of the causes which have been enumerated under anosmia may, during the process of irritation which precedes destruction of the olfactory nerve or centre, lead to subjective odoriferous impressions. These may also occur as auræ in epileptics, and Gowers mentions two cases of this kind, observed respectively by Sander and Hamilton, in which there were gross lesions found in the anterior part of the temporal lobe (the probable olfactory centre). Hallucinations of smell may also occur in insanity, hysteria, and hypochondria. Schech states that anosmia and parosmia may not unfrequently alternate in cases of cerebral tumour, but I have not been able to verify this observation either from experience or from reference to other authors.

No general rules can be laid down for *treatment;* but, obviously, if any tangible and tractable disease of the nose exists, it should be remedied.

CHAPTER XI.

THE ACCESSORY CAVITIES.

THE ANTRUM OF HIGHMORE.

NO doubt the commonest cause of inflammatory processes within the maxillary sinus is to be sought in dental caries. In this connection it is important to note that the size of the antrum is inconstant, and therefore, although disease of the first and second molars is the most common factor of irritation, that yet in the case of exceptionally large cavities caries of the incisors, canines, and posterior molars may lead to a similar result. Next in frequency, but numerically far behind dental caries, we must consider nasal disease. Probably, sometimes, a direct extension of inflammation occurs from the mucous lining of the nose. It must, however, be remembered that obstruction of the normal orifices of communication may lead to diminished pressure within the antrum, and finally to exudation, which may decompose and lead to inflammation. It is by no means uncommon to find empyema of the antrum associated with nasal polypi, but in a certain number of such cases I believe that the antral affection is the primary lesion, and that the polypi are the result of the flow of irritating pus over the nasal mucosa.

Inflammation of the maxillary sinus appears under two clinical aspects, according as (1) the secretion is retained and symptoms of tension are present, or (2) the inflammatory products have free drainage into the nose.

Inflammation of the Antrum, with Retention of the Inflammatory Products.—In a special work it is hardly necessary to spend time on the consideration of a condition which is so fully discussed in works on general surgery.

The patient complains of severe pain in the cheek and in the teeth of the upper jaw, the whole region of the antrum is extremely tender, and at this stage sudden relief may follow a profuse serous or purulent discharge from the nose. If the retained matter fails to find an exit, the osseous walls are distended. Sometimes pointing occurs towards the mouth, oftener the external wall of the corresponding nasal cavity is bulged, and occasionally the floor of the orbit becomes pushed upwards with resulting displacement of the eyeball.

Inflammation of the Antrum, with Free Draining of the Inflammatory Products into the Nose. — It is of the utmost importance that this form of disease should be recognised and treated. Although Salter, Heath, Lefferts, and Spencer Watson had distinctly recognised the condition as occasionally occurring, neither specialists nor general surgeons gave it sufficient attention until Ziem — interested in the matter by personal suffering—showed that blennorrhœa of the nose rarely occurs without disease of the accessory cavities, and pointed out as well as proved that where this symptom occurs, it is usually due to empyema of the antrum. Ziem's observations have, in the main, been confirmed by other authorities, excepting in one particular. According to most observers, empyema of the antrum is rarely bilateral, while the author in question seems to have met with an unusual number of cases of this kind. His experience was, in all probability, exceptional, as the occurrence of unilateral purulent discharge from the nose is one of the symptoms which first arouses the suspicions of the experienced rhinologist.

The *symptoms* complained of vary considerably; sometimes advice is sought for a chronic cold, and the unilateral character of the discharge has quite escaped the notice of the patient. Occasionally the chief feature seems to be obstruction of the nostril on the affected side, due to the swelling of the mucosa resulting from constant irritation set up by the flow of pus. A subjective sensation of bad smell, and an occasional bad taste when secretion descends into the mouth, are symptoms which can almost invariably be elicited by leading questions, and which are sometimes mentioned spontaneously. Pain is not uncommonly complained of, but it is usually situated in the frontal and supra-orbital regions; occasionally it is paroxysmal, and in all respects resembles simple neuralgia. This symptom is probably due to swelling of the orifice of the frontal sinus, and depends in a measure on the absorption of air in this cavity. In a certain number of cases the beginning of these symptoms can be traced to a severe attack of toothache, followed by swelling of the face, and, when this history is present, diagnosis is much facilitated. Assuming that the patient comes to the surgeon on account of unilateral discharge, it is usually found that this symptom is most marked on first getting up; and again in the case of those engaged in office-work, on sitting down to write. Sometimes patients observe for themselves the fact that it occurs more copiously when lying on the opposite side.

As a rule these facts are elicited during, or even after, objective examination. On inspecting the nostril with the speculum, the first point which strikes the observer is that the mucosa is generally congested and swollen. Sometimes polypoid excrescences are seen in the region of the middle meatus, and, as before stated, the association of antral empyema with true mucous polypi is by no means uncommon. Kaufmann has noted a swelling of the external wall below the middle turbinated body in many cases, but I have not in my experience found this lateral hypertrophy so definitely defined as the authority just cited. The characteristic feature of the affection is, however, a drop of pus situated in the upper part of the middle meatus, rather anteriorly, which, as pointed out by Walb, occasionally pulsates.

In order to see these parts more clearly, it is often desirable to apply cocain in order to diminish the general turgescence of the tissues. The drop of pus should now be wiped away, and the patient directed to hold his head over, with the affected side upwards. The nostril is afterwards again examined, and, if the pus has reappeared, the diagnosis of antral empyema is probably correct. The middle meatus should after this be again cleansed, and the patient directed to sit with his forehead down. As pointed out by B. Fränkel, neither the frontal nor the ethmoidal cells can drain their contents into the nose when the head is in this position, so that, if the pus reappears, the diagnosis is almost complete. Unfortunately, however, we meet with many cases in which this test gives a negative result, and in which antral empyema is present. Occasionally even the drop of pus in the middle meatus is absent, and all the discharge drains backwards—probably through an accessory orifice which not unfrequently exists in the middle meatus, just above the inferior turbinated body—into the throat. Posterior rhinoscopy is therefore useful in doubtful cases, and the constant presence of pus in the middle meatus, or on the upper surface of the posterior portion of the inferior turbinated body, associated with the flowing into the mouth of fœtid secretion, are the clinical features which direct attention to the antrum.

Sometimes there is a certain amount of tenderness on pressure over the region of the affected cavity, and occasionally the gum on the corresponding side is distinctly congested. Perhaps the most effective means of diagnosing the presence of pus in the antrum is to make an exploratory puncture with a hypodermic syringe, armed with a strong needle, through the outer wall of the nostril, as suggested by Moritz Schmidt, but I have always felt justified in arriving at a sufficiently definite diagnosis to warrant the recommendation of a counter opening of sufficient size to permit of irrigation at once. Aspiration through the normal orifice is recommended by Bresgen, and although I have probed the antrum in some cases through the natural opening, I do not think that any method which requires this can be looked upon as satisfactory, because the manœuvre is often impracticable.

Percussion, by means of a piece of wood placed inside of the first molars, was suggested by Linck, and is a method which has the high approval of Michelson.

Through illumination, first suggested by Voltolini, and further developed by Heryng, is a methed to which I attach considerable importance, especially when applied with the modification presently to be described. Voltolini first recommended it in order to differentiate accumulations of fluid from solid tumours, but Heryng pointed out that a cavity filled with pus is practically opaque. An electric lamp of about 5-candle power is placed, by means of a specially constructed tongue depressor, in the patient's mouth, the *séance* taking place in a dark room, and when contact is made, the amount of light transmitted through each antrum is estimated. As a matter of fact, I have often found this form of examination of little use when carried out in this way, because most of the illumination seems in many cases to be thrown through the teeth and into the nose. I therefore have added to my armamentarium a tube of dark metal, with a suitable eye-piece, the other end of which is applied like a stethoscope to corresponding regions of the two antra; in this way the amount of light transmitted through each can be more exactly estimated than by any previously suggested method.

By the means just discussed we are generally enabled to arrive at a correct *diagnosis* of antral empyema, when we combine the results so obtained with the history and semeiology of the case. It must also be remembered that the antrum is, of all the accessory cavities, the most frequently affected; indeed, from my experience I should be inclined to believe that antral empyema, with free outflow of pus through the natural orifices, is at least twenty times as common as a similar condition of all the other cavities together.

As *complications* which may result from empyema of the antrum may be mentioned secondary empyema of the frontal and other sinuses, caries, inflammation of the cheek and eye, and, according to Ziem, tonsillitis. Septicæmia of a mild type has also been observed, while in one of my cases the pus burrowed in such a way as to present as an abscess in the inferior turbinated body. Such complications are probably rare, and I should be inclined to consider empyema of the frontal sinus as the least uncommon, but my data on this point are still too few to make this statement of much value. Empyema of the antrum may be confounded with unilateral atrophic catarrh, but, if it be remembered that in this affection there is distinct atrophy of the mucosa, associated with the formation of crusts, while in the affection we are discussing the mucous membrane is usually thickened, and the pus remains fluid, confusion is unlikely to arise. A further means of differentiation lies in the fact that in antral disease the sensations of smell and bad taste are most observed by the patient, while in ozæna this is not the case. Moderate care will suffice to guard against confounding antral empyema with cases of foreign bodies and syphilitic ulceration.

As to the *treatment* of empyema of the antrum opinions are somewhat divided. Some observers, for example Hartmann and Stoerk, advocate draining and washing out the cavity through the natural orifice. It is certainly in some cases possible to pass a probe or delicate tube into the maxillary sinus. The instrument must be bent at an obtuse angle, and the point applied near the anterior end of the middle turbinated body and just below it, to the outer wall of the middle meatus. Slight pressure is made, and the probe or tube gently moved backwards until the orifice is found. Several of the advocates of this mode of treatment have advised that the middle turbinated body should be partially, or even wholly removed in order to facilitate finding the orifice. Considering the tediousness of the process, and the fact that it entails repeated visits to the surgeon, and that, after all, surgical indications are not fulfilled by it, irrigation by the natural opening cannot be recommended. As for the proposal to remove the middle turbinated in order to subject the patient to this uncertain method, I have no hesitation in giving it unqualified condemnation, for opening into the antrum is a milder and safer operation than removal of the middle turbinated, which constitutes a portion of the ethmoid bone.

As to the best method of opening the antrum authors are also divided in opinion. As we have seen, the root of the evil in most cases is to be sought in a carious tooth or stump, and this must certainly be removed. A favourite method of further treatment is to open into the cavity through the socket of an extracted tooth. A drainage tube is then inserted, and the antrum washed out daily, or twice daily, with boracic lotion, or some other disinfectant—the injected liquid flowing off by the nose. If the case prove obstinate solutions of carbolic (not stronger than 5 p. c.), or water containing a small quantity of iodine, may be employed. The objection to this operation is, in my opinion, that the wound produced is usually too small, and I therefore consider that a free opening above the alveolus in the canine fossa is most serviceable. A drainage tube is inserted as before, and through irrigation practised. Should the case prove tedious, Schech recommends that the cavity be plugged with iodoform gauze, after the opening has been sufficiently enlarged. Other authorities have advocated a still more radical method, which consists in scraping the lining membrane. Sometimes a good result follows the insufflation of antiseptic powders into the cleansed cavity, *e.g.*, iodol, iodoform, and boracic acid as recommended by Krause.

What is known as Mikulicz's operation has of late found great favour on the continent. This surgeon advises that the antrum should be opened from the inferior meatus of the nose just below the anterior portion of the inferior turbinated body. Of this method I have had no actual experience. Opening from the middle meatus, as originally suggested by Hunter, and afterwards by Jourdain and Zuckerkandl, does not fulfil surgical requirements, as the orifice is then far removed from the floor of the cavity.

Before leaving the subject of inflammatory affections of the antrum, it may be well just to refer to the fact noted by Weichselbaum that a phlegmonous inflammation, apparently of a septic character, and associated with enlargement of the spleen, liver, and kidneys, may attack the lining membrane of the maxillary sinus.

Tumours of the antrum.—I have no desire to encroach upon the domain of general surgery, and shall, therefore, say little on a subject which would be most appropriately discussed in a chapter on affections of the jaw.

Cysts are met with which may gradually and without pain distend the cavity, mucous polypi may also occur, while osteomata, fibromata, sarcomata, and epitheliomata, have been described. Obviously the difficulties of diagnosing the presence of such conditions, until external manifestations have appeared, are almost insuperable, as if any symptoms at all are present at this stage these are most likely to point simply to inflammation.

THE FRONTAL SINUS.

As far as is at present known inflammation of the frontal sinus is usually secondary to some form of nasal disease. It is commonly assumed by authors that the frontal headache, so familiar to most individuals from personal experience, which often accompanies a cold in the head, is due to implication of the lining membrane of the cavity in question. This I believe to be a fallacy, for were it otherwise, we should, no doubt, find more commonly inflammation of this region causing either tension or a flow of pus from the nose. This troublesome symptom of coryza is capable of a very simple explanation. The mucosa around the orifice of the frontal duct—for the recent observations of Schütz and Hansberg show that the sinus communicates with the nose by a duct, and not by a simple aperture—becomes swollen, and as a result the cavity is cut off from the external atmosphere. The contained air is soon absorbed, and the diminished tension leads to the disagreeable subjective phenomena. No doubt, if this state of matters were to continue long, a hydrops *ex vacuo*, followed by suppuration, might result. As before stated it is by no means improbable that the frontal sinus becomes the seat of inflammation as a secondary result of empyema of the antrum in a small proportion of cases. Before going further it will be well to state that inflammation of the frontal sinus is of decidedly rare occurrence. Usually the exuded secretion is purulent, but it may be mucoid in character.

Inflammation of the Frontal Sinus, with Retention of the Inflammatory Products.—This affection usually comes under the notice of the oculist rather than of the rhinologist. Pain is, of course, a more or less constant symptom, and associated with it is tenderness on palpation. As a rule the pus finds its way towards the orbit, where it presents a fluctuating swelling, and often causes epiphora, displacement of the eye, and diplopia. Occasionally the inflammatory products produce distention of the sinus towards the cranial cavity, and thus vertigo, paralysis, and other cerebral symptoms may be produced. A fatal issue may then occur, due to meningitis, cerebral abscess, or phlebitis.

Inflammation of the Frontal Sinus, with Free Draining of the Inflammatory Products into the Nose.—This affection gives rise to very much the same signs and symptoms as empyema of the antrum. There is the same history of chronic unilateral flow of matter from the nostril, with the presence of pus in the middle meatus. The mucosa of the nose may be thickened, and may even show granulations or polypi. Pain in the supra-orbital region is complained of, and occasionally a thickening of the bone is observed in the region of the sinus.

The reader will observe that in all these signs and symptoms there is nothing to differentiate empyema of the frontal sinus from a similar condition of the antrum. We have further seen that Fränkel's method of differentiating the two conditions, by making the patient sit with the forehead down after cleansing the nose, does not always yield a positive result in antral disease. It has been proposed by Jurasz to introduce a probe into the frontal sinus, but even when this is practicable—and it is rarely so—the information gained is of little value. More recently Vohsen has shown that the frontal sinus may be made to transmit light by placing the source of illumination over the orbital surface of the sinus. In these cases of empyema the cavity is always kept empty, because the orifice is at the lowest point, and therefore I fear this method will not yield much information, excepting in the case of tumours; and the fact remains that it is extremely difficult to differentiate empyema of the frontal sinus from a similar condition of the antrum. The presence of diseased teeth in the upper jaws, a history of toothache and swelled face, the results of through illumination and Fränkel's posture test may exist as evidences of the latter. On the other hand, if the teeth be intact, and if there be a history of *pain and swelling* in the region of the frontal sinus, these facts indicate the presence of empyema in this region. It is certain, however, that empyema of the antrum is so infinitely more common than the same affection of the frontal cavity, that the experienced rhinologist will, in doubtful cases, make an exploratory opening into the former, and if his experience be similar to my own, he will generally find that the maxillary sinus is at fault.

The *treatment* of inflammation of the frontal sinus must, of course, be energetic in those cases where the inflammatory products are retained. The cavity should then be opened externally, a strong probe or other instrument passed into the nose, and irrigation with antiseptic fluids kept up until a cure is established. Where we are able to diagnose empyema of the frontal sinus with free drainage into the nose, it is somewhat questionable whether we ought to interfere by surgical methods so long as no retention is present. Schäffer advises forcing a brass probe between the septum and anterior part of the middle turbinated body into the sinus, and follows this by scraping an opening with a small but strong sharp spoon. He finally applies a strong caustic (1 to 2 of chromic acid). This author seems to have met with quite an exceptional number of cases, but his practice —considering the propinquity of the parts to the cerebrum—is somewhat heroic.

Other affections.—Tumours occur in the frontal sinus, and of these osseous growths are most common—mucous polypi, cysts, and even a teratoma, have been described.

What has been said as to antral neoplasms applies here. Generally they cannot be diagnosed until they have produced distention. In suspected cases, however, Vohsen's method of illumination may possibly prove useful.

THE ETHMOIDAL CELLS.

These cavities are situated in two groups, the anterior and posterior. The cells composing the former open into the middle meatus, a little behind the orifice of the frontal sinus, while the latter communicate with the superior meatus. According to Berger and Tyrman these cells are commonly affected as a secondary result of nasal disease; but, on the other hand, they may become involved as a sequel, to inflammation of the orbit and even abscesses in this region may thus become evacuated into the nose. Schäfer has recorded a case in which an acute cold in the head was followed by swelling of the right eyelids and exophthalmos. There was also profuse fœtid discharge from the corresponding nostril, and an orbital abscess was evacuated. Fluids injected into the abscess cavity flowed off by the nose, but eventually the patient died of meningitis. There was found on *post mortem* examination a large collection of pus in the ethmoid cells, associated with caries. A very similar case, ending in recovery, was recorded by Hartmann.

The opinions of authors are divided as to the occurrence of inflammation of the ethmoidal cells without tension. Woakes believes that recurring ethmoiditis is a common condition; but general experience seems to contradict the connection between the clinical pictures he gives and the pathological condition to which he ascribes them. Schäffer speaks confidently of the occurrence of suppurative ethmoiditis without tension, and his views are supported by a series of cases. According to this author, the purulent secretion in these instances tends to form a crust between the inferior and middle turbinated bodies, while attacks of swelling and pain occur periodically over the cheek and infra-orbital region, sometimes associated with enlargement of the middle turbinated body. I cannot say that I have been able to confirm these observations from experience. It is certainly true that, after the removal of nasal polypi, we occasionally meet with a continuous flow of pus; but whether this results from the ethmoidal or other sinuses must, with our present methods of diagnosis, remain uncertain in many cases.

In one patient I was enabled to observe the constant presence of pus on the upper and posterior aspect of the middle turbinated body, and therefore felt justified in suspecting the existence of disease of the posterior ethmoidal cells.

As can be gathered from the foregoing remarks, suppuration of the ethmoidal cells, without tension, is a disease of which little that is certain can be written.

Where the condition is suspected with a reasonable amount of probability, the recommendation of Schech and Schäffer may be followed. These authors advise that an opening be made between the middle and inferior turbinated bodies. Schäffer uses for the purpose his strong but delicate sharp spoon forcing it outwards, backwards, and upwards, and scrapes out the cavity which he enters; afterwards irrigation with antiseptic washes is employed.

The ethmoidal cells may be involved by tumours, and of these the most common are mucous polypi, and osseous growths, while malignant neoplasms may also occur. As in the case of other sinuses, they can only be diagnosed when they have broken down or dilated the bone, or when they invade it from without.

SPHENOIDAL SINUS.

Inflammation of this sinus may result from nasal disease, but its etiology is, owing to the almost insuperable difficulties attending its diagnosis, still uncertain.

In one case diagnosed and successfully treated by Ruault, the cause seems to have been either rough removal of mucous polypi or empyema of the maxillary antrum.

The first to diagnose and treat chronic empyema of the sphenoidal sinus was Schäffer, who has now observed ten cases in all. Ruault, Bronner, Heryng, and Greville Macdonald have also made similar observations. Ruault's patient seems to have suffered from pain, tinnitus without deafness, and giddiness, or rather, clouding of the intellect. Schäffer describes the pain as seated chiefly in the middle of the head, but shooting to the occipital and supra-orbital regions, but a case recorded by Rouge in 1872 serves to show how unreliable this symptom must be considered. A lady suffered at first from nasal speech, then from left-sided exophthalmos and strabismus, and, later on, deafness and blindness occurred. As she complained of pain in the region of the maxillary antrum, this was operated on, and the sufferer soon afterwards died, when, on dissection, the sphenoidal sinus was found filled with purulent *debris*.

Authors seem to regard the presence of pus on the vault of the pharynx as a sign of this affection. According to Schäffer, the secretion is seen on the side affected—for the sphenoidal sinus is usually composed of two cavities, each having an exit—near the septum, and flows down into the naso-pharynx, while only rarely does it run into the superior meatus. In either case it tends to form a crust. The secretion is usually offensive, and this is, as in the case of the other accessory cavities, perceived more by the patient than by those around him.

The *diagnosis* is extremely difficult; but I have never met with a case, and do not therefore feel justified in discussing the matter authoritatively. It would seem, however, difficult to differentiate the affection in question from catarrhal inflammation of the anterior portion of the median recess of the naso-pharynx (bursitis of Tornwaldt). As if to emphasise the difficulty, this writer believes that Stoerk, in describing a case of sphenoidal disease, really gave an account of inflammation of the so-called bursa.

The *treatment* adopted by the authors mentioned consisted in opening into the sinus by passing an instrument along the projection of the middle turbinated body, and directing it rather upwards as well as backwards. Schäffer employs for this purpose his sharp spoon, or, as he designates it, "Löffelsonde."

Tumours are met with in connection with the sphenoidal sinus. Osseous growths, mucous polypi, and malignant disease have been described, and pain, blindness, exophthalmos, followed by other evidences of cerebral disease, may result from them.

THE EAR.

DISEASES OF THE EAR.

CHAPTER I.

METHODS OF EXAMINATION.

IT would be manifestly out of place to touch upon methods which are at the command of every practitioner. I refer here to such points as inspection and palpation of those parts which are freely accessible to sight and touch. It is also unnecessary to enlarge at this period upon semeiology, although, of course, at an early stage of the examination, symptoms are naturally discussed between surgeon and patient.

TESTING THE HEARING POWER.

In most, if not all, cases of ear disease, it is extremely desirable to test the hearing power, and—if time and opportunity allow—to record in each case the results derived from such tests. It must be borne in mind that many persons who consult the aurist, for example, on account of tinnitus, and whose hearing is distinctly impaired, yet deny—sometimes almost with indignation—any suggestion of deafness. The explanation of this is to be sought in the fact that amongst civilised surroundings the normal ear is rarely called upon to exert its functions to the fullest possible extent; it therefore follows that a very considerable amount of hearing power may be lost without any corresponding appreciation of the fact. Auditory perceptions may be conveyed to the sensorium by either or both of two channels, to wit—(*a*) through air conduction; (*b*) through the bones of the head, or bone conduction.

(*a*) *Hearing Tests by Air Conduction.*—Much ingenuity has been expended upon the invention of methods for measuring and registering the hearing power. Thus Politzer has constructed what he hoped would fulfil the requirements of a uniform acoumeter. Again, others, moved by the electric spirit of the age, prefer to register the hearing power of their patients by means of a Neef's hammer and induction coil.

For the practical aurist, however, two more convenient methods suffice,—viz. (1) the watch, (2) the voice.

Before using a watch for the purpose of testing hearing, it is important to know the distance at which the tick is heard by a normal ear. Assuming that the distance is 30 inches, this gives us a definite standard of comparison. For purposes of case-taking Prout has supplied us with a very convenient method of recording the results obtained, which consists in the employment of a fraction, of which the numerator is the number of inches at which the watch is perceived by the patient, while the denominator represents the distance at which it is ordinarily perceived by a healthy organ. If, for example, a patient hears a watch at 3 inches, which ought to be audible at 30, the hearing power is expressed as $\frac{3}{30}$.

In using the watch as a test, certain precautions are necessary. It is often desirable to have the opposite ear closed, and it is of the utmost importance to begin with the watch outside of the range of hearing. It is then gradually approached until the patient states that the tick is perceived, and the distance thus obtained (after one or two more check experiments) is entered as the hearing power for the watch.

In exceptional cases it may be desirable to test the hearing power by air conduction for sounds of different pitch. It is now generally admitted that Lucæ was correct in believing that impairment of hearing most marked for high notes, while low tones are relatively well perceived, indicates a probable lesion of the labyrinth. This author therefore advises the employment of a number of tuning-forks of varying pitch, and suggests, in cases of great deafness, the addition of a corresponding resonator to facilitate hearing. Sometimes in this way distinct gaps in hearing can be detected, which, according to the physiological views at present most in favour, are usually ascribed to a lesion of the cochlea. Other observers employ musical instruments in order to ascertain the hearing power for different notes, while Burckhardt-Merian advocated the use of Galton's whistle for testing the perception of high tones, and König's cylinders have also been used for the same purpose. Sometimes patients themselves notice that certain high-pitched sounds, such as the chirping of a cricket and the call of a partridge, are inaudible, while their hearing capacity for ordinary purposes is tolerably good. According to Bezold the power of hearing low notes is most impaired in affections of the sound-conducting apparatus, *i.e.*, meatus and middle ear.

Let us now turn to a consideration of the human voice as a test of hearing power. Before detailing the method to be employed, a few words of introduction are necessary. Obviously this method of testing is the most important, for, to the average person, it matters little if he be deaf to the ticking of a watch, or even to the vibrations of a tuning fork, if only he can understand conversation. In employing this test it must be borne in mind that certain letters are more readily perceived than others. Thus vowel sounds are more easily perceived than consonants, and of the latter some are more readily heard than others. Clarence Blake has constructed a table of what he terms the logographic value of the consonants. If, according to this authority, we take 100 as the maximum, and, as such, apply it to the letter which is most easily perceived, an accurate idea of relative value is afforded by the following numbers:—T = 100, B = 53, P = 58, D = 45, G = 56, S = 40, Z = 63, C = 62, F = 35, K = 31, L = 21, N = 11, M = 9. Wolf has recently divided consonants as follows:—

(1) (*a*) Acute and far-sounding hissing sounds—S, Sch (*i.e.*, Sh), G soft (*i.e.*, like *y* in yet).
   (*b*) Acute sounds of low intensity—F and V (*N.B.*, the German V = English F).

(2) Explosive sounds of medium pitch—B, K, T.

(3) Grave sounds—M, R.

Thus this author seems to propose that these letters be sounded in words as a substitute for the various instruments which have already been considered, *e.g.*, tuning-forks, Galton's whistles, &c. According to him the letter R represents a sound of very low pitch (16 vibrations per second), and S is characterised by the opposite quality (from 5400·10800 vibrations per second). He has noticed that the R-sound is badly perceived in perforations of the tympanic membrane; but if, with the conducting apparatus intact, it be still proportionately badly heard, he considers this fact evidence of involvement of the labyrinth. The reader will observe that this statement is opposed to the views of Bezold just referred to, for he considers that low sounds are worse heard in lesions of the conducting apparatus. It may seem ill-advised to introduce such conflicting views into a text-book. I have, however, done so with premeditation, as I consider that too much has been positively asserted in certain quarters as to the value of tests by sounds of different pitch in differentiating lesions of the sound-perceiving from those of the sound-conducting apparatus.

In testing intelligent adult patients with the voice little difficulty is experienced. As many such patients unconsciously acquire the art of lip-reading, it is well that the individual to be examined should be seated sideways, with the ear towards the surgeon, and without looking at him. The observer then retires to the opposite side of the room and whispers a word, which the patient is directed to repeat whenever he hears it, the other ear being meanwhile stopped up by his finger. If it be not perceived, the surgeon gradually approaches until the whisper is uttered quite near the patient. If it be still unheard he again retires, and this time employs his voice pitched in an ordinary conversational tone, gradually approaching as before until it is heard. If even this be not repeated when uttered near the ear, a loud voice must be employed. The results of such an examination are noted in my case book thus:—Whisper at —— feet. Ordinary voice at —— feet. Requires raised voiced at —— feet. It is my custom in taking notes further to subdivide as follows:—

$$\text{Whisper, . . } \begin{cases} \text{low.} \\ \text{distinct.} \end{cases}$$

$$\text{Ordinary voice, } \begin{cases} \text{low.} \\ \text{distinct.} \end{cases}$$

It has been proposed by Lichtwitz to employ the phonograph as a means of establishing a universal standard of measurement, but this scheme strikes me as more theoretical than practical.

In the case of children it is often impossible to test the hearing either by means of the watch or voice in a satisfactory manner. Indeed, unless the child be unusually self-possessed and intelligent, its statements as to the watch will be found perfectly unreliable. In the case of the voice more can be achieved by first putting the little patient at ease, and then entering into conversation, while as confidence is engendered the observer closes up the ear which is not to be examined and asks questions which require an answer. It is sometimes advisable to explain the *modus operandi* to the parents, and request them to make tests of the hearing power at home when the child is free from the fear inspired by the "strange doctor."

(*b*) *Hearing by Bone Conduction.*—There can be no doubt that in persons who are very deaf from some impediment to the conduction of sound through the meatus and tympanum, a certain number of sonorous vibrations reach the auditory nerve by bone-conduction, *i.e.*, the aerial vibrations are communicated to the bones of the skull, and thence to the auditory nerve, in part directly and in part by way of the tympanic structures. This is sometimes illustrated by the increased facility which is experienced in conversing with certain deaf people if the hand of the speaker be applied to the patient's head.

Occasionally the watch is applied as a test of bone-conduction, but I do not think that it is ever of any practical utility. The instrument in common use among aurists is a tuning-fork, and for this purpose it is usually sufficient to have one fork, as suggested by Politzer, of about 512 vibrations per second, and supplied with metal clamps. These not only diminish the overtones, but by moving them downwards on the branches the note can be raised in pitch through an octave.

The tuning-fork test rests mainly upon two physiological experiments, to wit, Weber's and Rinne's.

Weber's Experiment.—Weber first pointed out that if the stem of a vibrating tuning-fork be applied to the middle line of the skull, and if one ear be stopped with the finger, the vibrations are perceived chiefly or only by the closed ear. In many cases of disease of the meatus and of the middle ear with intact labyrinth the same result is obtained, so that aurists have laid considerable stress upon the result of the tuning-fork test so applied in estimating the condition of the auditory nerve.

Rinne's Experiment.—If a vibrating tuning-fork be applied to the mastoid process of a healthy ear, left there until it has become inaudible, and finally held in front of the meatus, its vibrations will be again heard. This result, as it occurs in the normal ear, is spoken of as positive, while the inverse is called negative. If, then, the tuning-fork test applied to an ear with impaired hearing give a positive result, it is believed to justify a suspicion of labyrinthine disease.

The actual value of bone-conduction in estimating the condition of the auditory nerve is certainly problematical. No doubt, as Schwartze has put it, the fact that sounds are perceived through the cranium excludes complete paralysis of the auditory nerve. It is equally certain that in many of the typical labyrinthine lesions as we know them, *e.g.*, true Menière's disease, bone-conduction is lost or much diminished, while in typical lesions of the sound-conducting apparatus, *e.g.*, obstruction of the meatus, and middle ear catarrh, it is exaggerated. This we know, because we are enabled to diagnose such lesions by other methods; but our knowledge rests, be it observed, not upon a broad basis of pathological anatomy, but upon a mass of facts derived from the diagnosis of cases by methods of which the tuning-fork test for bone-conduction is not one. While, therefore, I do not deny that in typical cases the presence or absence, diminution or increase of bone-conduction is a convenient test, and often yields a correct result, I have as yet seen or read nothing which has convinced me that, in really doubtful cases, either Weber's or Rinne's experiments can be considered of any real value. To this conclusion I have been driven by the following facts:—

(1.) Weber's and Rinne's experiments often yield directly opposite results.

(2.) I have known almost total deafness in one ear result from a fall, without any evidence of injury to the meatus or tympanum, and yet the vibrating fork was better heard by bone-conduction on the affected side. Schwartze has recorded a somewhat similar case.

(3.) Opinions of observers as to the relative merits of Weber's and Rinne's experiments are at variance.

(4.) Such opinions are not based to any appreciable extent upon pathological anatomy, but only upon the assumption that the experimenters have been able to diagnose between lesions of the sound conducting and sound perceiving apparatus, without the aid of bone-conduction tests. Their observations are, therefore, only of value in so far as they confirm the broad rule that in deafness due to lesions of the meatus and middle ear, bone-conduction is generally intensified while in labyrinthine disease it is usually diminished. I have not referred by name to the innumerable papers which have been written on this subject, but I cannot refrain from quoting from Steinbrügge who, in addition to being an aurist of note, is the first living authority on pathological conditions of the labyrinth. After criticising the tuning-fork test he writes:—"For these reasons it is pardonable to doubt whether the present authoritative estimation of all these experiments in any way facilitates our diagnosis; and this doubt will arise despite our admiration for the diligence, skill, and erudition, which have here been displayed. On the contrary the difficulties seem to increase, the tests occupy more and more time, grow more and more complicated, and the exceptions are multiplying. And despite all this labour, our diagnosis must still rely on the history, the results of objective examination, and clinical symptoms; while, moreover, the investigation of even these conditions is difficult enough, and occupies quite sufficient time."

In spite, however, of all these criticisms of the tuning-fork tests it is desirable that the student of otology should carefully carry out both Weber's and Rinne's tests in each case, because, although they give us no absolutely correct idea as to the condition of the labyrinth, yet our classification of aural maladies is still so imperfect that it must, in many cases, rest upon clinical types, and in framing such clinical pictures the results of the tuning-fork test have been freely utilised. Thus, as we shall see later, there is a form of middle-ear inflammation which—whether rightly or wrongly, I do not, in the absence of any number of *post mortem* records of cases observed *intra vitam*, profess to say—is so classified from its clinical features, one of the most prominent of which is increased bone-conduction.

When the vibrating fork is applied to the middle line of the head, it is well to caution the patient not to be prejudiced by his knowledge that one ear is more deaf than the other, but to observe carefully, and state definitely, whether the vibrations are heard better on one side than the other. It is also often important to call attention to the possibility of mistaking the sensation of vibration felt over the head for an auditory perception.

Gellé has attempted to formulate a scientific application of the tuning-fork test as follows:—According to this author if the tympanic membrane and chain of ossicles be forced inwards by compressed air in a normal ear, bone-conduction is interfered with, or in other words a vibrating fork is less well heard while the column of air in the external meatus is compressed. This he ascribes to the increase of tension, communicated through the drum-membrane to the ossicles, including, of course, the stapes which is forced inwards, thus causing increased pressure on the labyrinthine fluid. If, however, there be fixation of the membrane or ossicles at any point, no such increased tension can occur, and compression of the air in the meatus cannot diminish the perception of the tuning-fork. This method is, however, seldom used, and, according to Politzer, it is inferior to Rinne's experiment as a test.

EXAMINATION OF THE MEATUS, TYMPANIC MEMBRANE, AND MIDDLE EAR.

Although the external meatus and tympanic membrane can be inspected by direct light, yet the results so obtained stand far behind those yielded by the employment of a reflecting mirror. Inspection of the ear can be efficiently carried out by means of a reflector, such as we employ in laryngoscopy and rhinoscopy, but a mirror with a shorter focal distance, and of smaller size, is better for the purpose. The *reflector* still generally in use is similar to that suggested by Von Tröltsch, to whom belonged the credit of first carrying out examination of the ear by reflected rather than direct light; the diameter of this mirror is about 3 inches, and its focal distance approximately 6 inches, while its centre is perforated. For an ordinary examination, it may be employed attached to a handle which is held in the surgeon's right hand, while if it be desired to have both hands free for operating purposes, it is adjusted to a forehead band or spectacle frame as in laryngoscopy. In addition to the reflector, *aural specula of different sizes* are required. It is not my intention to discuss the various forms of speculum, which authorities have in their leisure moments invented, and then named after themselves. For my own part I prefer silver or nickel plated instruments,—a convenient shape being that known as Gruber's. Vulcanite instruments, however, also answer the purpose, and are more convenient when it is desired to employ caustics. The most essential feature in a speculum is that it should not be of too great length, as this materially interferes with the employment of instruments. In addition to these appliances it is always advisable to have at hand a small angular forceps with which to remove flakes of cerumen, and also a syringe in case of larger obstructing masses; a probe,[1] which like the forceps should be bent, so that the hand does not come into the line of vision, may also be required in order to verify a diagnosis. As far as inspection of the ear goes, this armamentarium is sufficient for the practitioner. Various more or less complicated appliances have been employed for the purpose of examining the ear. Thus the speculum known as Brunton's is much used in England. By its means an enlarged image of the tympanic membrane can be obtained, and with this object in view the instrument has been still further modified by Voltolini. Weber Liel also constructed an "ear microscope," as he termed it, capable of magnifying the image of the tympanic membrane fifteen times. De Rossi and Blake have by the use of prisms attached near the mirror or to the speculum, enabled binocular vision to be employed in examination of the ear; but these methods are unnecessary, as a very little practice enables the observer to train himself in estimating appearances and distances with one eye.

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[1] As small cases containing all those instruments can readily be obtained, it is needless to enter into minute description.

Assuming, then, that the surgeon is supplied with a mirror and specula, it still remains to discuss the source from which *light* is derived. Much less powerful illumination is here required than in laryngoscopy or rhinoscopy. The best illumination is daylight in a fairly clear atmosphere. If this be not attainable, a gas burner, oil lamp, or even in emergency a candle will suffice. The Welsbach light is very convenient, as its clear white illumination does not tend to communicate a yellow tinge to the parts examined. For the same reason daylight is to be preferred to most artificial methods, and it is, therefore, advisable to conduct the examination of aural cases in a room with a window towards the south—especially in winter. The patient is seated with the ear to be examined away from the source of light. The surgeon then grasps the auricle, pulling it upwards and backwards. As the cartilaginous and osseous portions of the meatus meet one another at an angle which opens downwards and forwards, this manœuvre has the effect of converting the auditory canal into a straight tube. Light is then thrown upon the parts, and in this way the outer portions of the canal can be examined. A few words upon the use of the reflector are here necessary. As before said, for purposes of simple examination, the mirror is held in the disengaged hand, at about six inches from the ear. Great difficulty is, however, often experienced by beginners in concentrating the rays upon the desired spot. Expertness in this respect can only be acquired by practice, but it must always be remembered that the reflecting surface of the mirror must be directed towards the source of light. From experience at my hospital clinics, I believe that neglect of this simple and self-evident fact is one of the commonest errors committed by beginners. Thus, if daylight be employed, it is essential that the surface of the mirror be directed slightly upwards, as well as towards the window. Having overcome these initial difficulties, and having further, from the view gained of the meatus, judged approximately the size of speculum most suited to its calibre, one of these instruments is next introduced. In employing a speculum, it is always desirable to use an instrument of as large calibre as possible, for in this way more light is permitted to enter. When introducing the instrument, the auricle is pulled upwards and backwards, by holding it between the middle and ring fingers, while the speculum lies between the index and thumb. The speculum is then gently insinuated down to the beginning of the osseous meatus, a distance of about $\frac{1}{3}$ inch. It causes unnecessary pain to the patient, and in no way aids examination to attempt to push it further, as it is obviously impossible to dilate the osseous portion. After this stage the observer may find the view obstructed by wax, pus, or other abnormal condition. If small flakes of cerumen or epithelium be present, these may be removed with the angular forceps, while the mirror is attached to a forehead band, in order to leave both hands at liberty. Sometimes large masses require removal with a syringe, or we may meet with obstacles due to pathological changes which cannot be thus removed, *e.g.*, exostoses.

If no such obstruction exists, however, the observer will now be able to inspect the osseous meatus and the tympanic membrane. As a preliminary, it must be borne in mind that the anterior and inferior walls of the osseous meatus bulge inwards, and that this bulging ceases as the membrana tympani is approached; so that at the point where these walls meet the drum-membrane a recess is formed (sinus of the external meatus), in which small foreign bodies may lodge. The conformation of the parts, too, often renders it impossible to see the whole of the anterior portion of the membrane.

Let us now turn to a consideration of the *appearances of the membrana tympani.*[1] It appears to the eye of the observer as a bluish-grey membrane, having a somewhat polished surface, and careful inspection shows that its upper and posterior parts are nearer the eye than the anterior and inferior. Whenever a view of the parts has been obtained, the eye is attracted by a yellow ridge which runs from above and in front downwards and backwards to a little below the centre of the membrane. This is the *manubrium mallei* (*a*) or handle of the malleus. If its upper extremity be inspected, it will be seen to constitute a distinct projection—the *short process* (*b*). Immediately above it, and corresponding anatomically to a deficiency in the osseous tympanic ring, to which the membrane is attached, is seen a small portion of the drum-membrane, which differs from the remainder of that structure, in so far that it contains none of the fibrous tissue proper to the drum or substantia propria. It is spoken of as membrana flaccida or *Shrapnell's membrane* (*c*), while the deficiency in the tympanic ring, which it fills, is called the notch of Rivini. According to Bochdalek, there is a small perforation constantly present in the membrana flaccida. If it be so, the foramen is not usually detectable by our methods of examination. I have, however, met with such an orifice, which was clearly visible in a patient in whom careful examination failed to detect evidence of past or present ear disease. Coming back again to the short process of the malleus, close inspection will reveal the fact that its projection causes some elevation of the adjacent portions of the membrane, and so, even in the normal ear, slightly *marked folds* result, which pass backwards (*posterior fold*) (*d*) and forwards (*anterior fold*) (*e*).

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[1] Often also called "drum-membrane" and "drum-head."

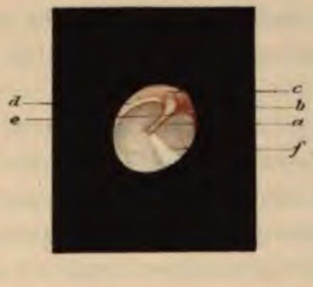

FIG. 24.—Normal tympanic membrane. (*a*) Manubrium mallei or handle of the malleus; (*b*) short process; (*c*) membrana flaccida; (*d*) posterior, and (*e*) anterior folds; (*f*) bright spot.

At the lower extremity of the handle of the malleus we see an opacity of the membrane often associated with a tinge of yellow. This is the position of the greatest concavity, produced probably by the tension of the tensor tympani, and is spoken of as the umbo. Meeting the lower extremity of the manubrium at an obtuse angle opening forwards is to be seen the triangular *bright spot* (*f*), which is due to the way in which the membrane reflects light, and depends, of course, upon its position and lustre. In a healthy ear this reflex is often a perfect triangle, but when we consider that slight changes in the lustre of the membrane, which need not necessarily interfere with the function of hearing, may materially influence its contour, too much stress must not be laid upon alterations in the shape of the bright spot as evidences of disease. Bright reflecting areas may also be seen occasionally in other parts, *e.g.*, the posterior superior quadrant.

While examining the membrana tympani the observer will notice that the malleus (if we imagine it continued to the periphery) divides it into two unequal segments, of which the posterior is considerably the larger. For purposes of description it is usual to divide each of these segments into an upper and lower part, and to describe the divisions resulting as quadrants.

The colour and appearance of the membrane may be modified by anatomical structures within the tympanum. Thus it is not uncommon to see a short opaque streak in the upper and posterior quadrant running parallel to the handle of the malleus for a short distance. This appearance is due to the long process of the incus. If the membrane be atrophied we may also be enabled to see the head and one or both crura of the stapes. Occasionally in the same quadrant an opaque line is seen running from just below the short process backwards to the periphery, an appearance due to the chorda tympani nerve. If the drum-membrane be very transparent, a dark, almost black, patch may be noted in the posterior inferior quadrant, caused by the deep niche which leads to the fenestra rotunda.

Having obtained a satisfactory view of the membrane, the observer usually proceeds to test its mobility. This object may be accomplished by various means.

Valsalva's Experiment.—In the normal subject, if the patient be directed to hold the nose tightly, shut his mouth and forcibly expire, the air passes up the Eustachian tubes and impinges upon the membrane. This is known as Valsalva's experiment. If the speculum be introduced, and the drum-head examined while this procedure is repeated, it will be seen to move. If there be nothing to interfere with its mobility, and if the Eustachian tubes be pervious, quite a marked movement can be detected; if immediately afterwards the patient be directed to swallow, the nostrils being still closed, the membrane is seen to recede to its former position. Sometimes only a slight movement is detected in the posterior superior quadrant, where during the excursion a reflecting spot often appears, only to disappear after swallowing. It is of great importance to train the eye to appreciate the change of shape in, or the sudden appearance and disappearance of, such bright areas, as, in this way, a very slight change of position can often be detected. If a membrane moves outwards and immediately, without swallowing on the part of the patient, falls back, this may, and often does, indicate that it is fixed by adhesions. When a perforation exists, the air, of course, passes through the orifice and causes no movement, unless there be fluid present, in which case bubbling results, associated with a gurgling sound. It is important not to allow persons with weak hearts to use much pressure in attempting to inflate the ears, for, as I have elsewhere shown, an attempt at expiration with the outlets closed tends to cause arrest of the heart's action and syncope.

If an assistant be present he may be directed to force air into the tympanum by means of one of the methods afterwards to be described.

Siegle's Pneumatic Speculum.—This is an instrument similar to a large ordinary speculum, often made of vulcanite. Its outer extremity is covered with glass, while into its lumen is an orifice connected with a tube, to which is attached a small indiarubber ball. If the extremity of the instrument does not fit air-tight into the meatus, this object can usually be accomplished by wrapping round it moist cotton wool, or encircling it with a piece of indiarubber tubing. If now the small ball be alternately compressed and relaxed, it is obvious that those parts of the membrane which are mobile must move under the influence of the alternate compression and exhaustion of the aerial column contained in the meatus. Siegle's speculum is also useful in detecting the existence of small perforations, but unfortunately the presence of fluid in such instances—for the doubtful cases where this method is useful are usually associated with suppuration—causes the glass plate to be covered with a film which prevents prolonged examination.

In many cases it is of the utmost importance to note the effect of forcing a current of air through the Eustachian tubes. Indeed, as we shall see later, this is often the only means of arriving at a correct diagnosis and prognosis. Valsalva's experiment, of course, is one mode of effecting this, but stands far behind both Politzer's method and the Eustachian catheter. When air is being driven into the tympanum, the ear of the surgeon should be connected with that of the patient by means of an auscultating tube[1]—simply a piece of rubber tubing, having an ear piece at either extremity. Whether air has entered or not can usually be detected in this way, even when Politzer's method is employed, but the finer auscultatory phenomena are best appreciated with the aid of the catheter.

Politzer's Method.—For this purpose an indiarubber bag—known as Politzer's bag—is required. It is perfectly the same whether it be furnished with a specially devised nose piece or not. For my own part I always use the simple bag, and protect the pointed nozzle with a piece of tubing, which should be changed for each patient, or, in hospital practice, washed in carbolic or corrosive solution after use. Lucæ and Zaufal have devised methods by which the air is rendered aseptic before its entrance into the nose, but practical experience does not seem to indicate any necessity for this precaution. The patient is given a small quantity of water to hold in his mouth, while the ears of the operator are connected with those of the patient by means of auscultating tubes. The nozzle of the air bag is now placed within the nostril, as near the lip as possible, while the bag is grasped with the right hand, and the opposite nostril, together with that part of the other not filled by the instrument are firmly compressed with the index finger and thumb of the left hand. The signal to swallow is now given, and the bag is sharply and powerfully squeezed, just as the characteristic movements in the region of the larynx are seen to begin. As a result of this manœuvre air rushes into both tympana, unless marked obstruction exists. During the act of deglutition, the Eustachian tubes are opened by the action of the tensor palati, levator palati, and to a less degree the salpingo pharyngeus muscles; the naso-pharynx is also shut off from the parts below by the elevation of the soft palate, and thus the compressed air finds its only exit towards the tympana. Politzer's inflation is, as a rule, well tolerated by patients, but occasionally it causes unpleasant symptoms, such as vertigo, tinnitus, and even syncope. One of the most common disagreeable effects is that a quantity of air enters the stomach, and thus gives rise to pain, which lasts until eructation has followed. In cases of chalky and atrophied drum-membranes, too, rupture may result. For all these reasons it is well to begin with methods which are less violent in their action. Such are supplied by various modifications which have been suggested, and if they are ineffectual, resort may then be had to swallowing. They are all less forcible, because, while shutting off the naso-pharynx, they do not, at the same time, appreciably dilate the

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[1] Sometimes called "otoscope" and "otophone."

Eustachian tubes. In ascending order, beginning with the mildest, they may be classified as follows:—

Holt's Modification.—Here simply blowing out the cheeks is substituted for swallowing. This method has the advantage that the act utilised is productive of no sound, and, therefore, the auscultatory phenomena can be better appreciated.

Phonation of vowel sounds, as suggested by Lucæ.

Phonation of "huck," as employed by Gruber, the air bag being compressed as the "ck" is sounded.

Fortunately in children the *act of crying* can be employed as a substitute for the above-mentioned methods. In compressing the air I have always found the hand bag quite sufficient, although I am aware that air compressed by special apparatus has been employed.

The Eustachian Catheter.—When air cannot be driven through the Eustachian tubes by any of the preceding methods, or when the observer desires to study carefully changes in the Eustachian tube and tympanum, as they are revealed by auscultation, this instrument must be employed. From a therapeutic point of view catheterism is specially indicated where it is desirable to act upon one ear only. It is true that Löwenberg has endeavoured to confine the effects of Politzer's method to one ear by attaching to the air bag a second tube with an earpiece, which is inserted into the ear upon which it is not desired to act. Löwenberg's idea is that in this way whatever increase of pressure occurs from within, is met by an equal increase from without; but it must obviously remain uncertain whether these respective increases of tension occur at the same moment.

The Eustachian catheter is a bent tube made of silver or vulcanite, the latter being, in my opinion, preferable. The calibre and the amount of the curve vary in different instruments, and the surgeon should be provided with at least three sizes. The extremity of the straight portion of the catheter is dilated so as to receive the nozzle of a Politzer's bag, while at this end is also situated a ring to indicate the direction of the curved point after it has disappeared within the nostril.

In most cases where the Eustachian catheter is required, a rhinoscopic examination is also called for; it is well to carry this out first, as the suitable size of instrument can thus be approximately guaged, and any conditions likely to interfere with its introduction detected.

When introducing the catheter, the patient should be seated with his face towards the light. The surgeon stands in front of him, having a Politzer's bag under the left arm, while the Eustachian catheter is held delicately between the thumb and first two fingers of the right hand; at the same time the ear of the operator is connected with that of the patient by means of an auscultating tube. The tip of the nose is now gently tilted upwards with the thumb of the left hand, while the hand is at the same time steadied by resting the little and ring fingers on the forehead. The catheter is introduced into the nostril point downwards (*i.e.*, towards the floor of the nose). In the first stage the outer extremity is held lower than the curved end, to enable the latter to pass over the elevated anterior margin of the nasal floor. Whenever it is passed—and this occurs immediately the curved extremity lies within the nostril—the hand is raised so as to bring the straight part of the catheter to a horizontal position. The instrument is then guided straight backwards, with the point towards the floor, along the inferior meatus until it reaches the posterior wall of the naso-pharynx. As a rule, little difficulty is experienced in accomplishing this; sometimes, however, an obstruction is encountered in the nose, which is usually due to a deviated or thickened nasal septum, and may often be overcome by turning the point outwards. Excepting on rare occasions, force should never be employed.

If the manœuvre described does not succeed, and if a rhinoscopic examination has not been previously made, the cause of the difficulty should be discovered by a careful examination of the nose. This will show at once how the obstruction can be most easily passed, or whether the nostril is capable of admitting the instrument. Having reached the naso-pharyngeal wall, the most simple method of introducing the point of the instrument into the orifice of the Eustachian tube is to rotate the catheter through an angle of 90° towards the opposite ear, and withdraw the instrument until the curved extremity hooks upon the nasal septum; the fingers of the left hand are now used to fix the instrument, and then a second rotation is effected through an angle of rather over 180°, while the outer end is pressed towards the middle line. As a rule, the point of the instrument now lies in the Eustachian tube. When the catheter is in position, the ring (corresponding to the curved extremity) points towards the outer canthus; occasionally however, it is pointing directly outwards, and sometimes the extreme rotation possible represents an angle of less than 180°. It may happen that, instead of being caught by the prominent upper wall of the Eustachian tube, the catheter permits itself to be rotated quite round its axis. In this case, the instrument either has too slight a curve, or the point has not been sufficiently pressed outwards.

Rhinoscopic examinations show that the orifice of the tube may present variations in shape. The upper, a small portion of the anterior, and the whole of the posterior wall of the Eustachian orifice are formed by cartilage, and, as a rule, this forms a prominent projection. In certain instances, the trumpet-shaped orifice so produced is but slightly raised above the level of the lateral wall of the naso-pharynx. Under those circumstances, a catheter with a considerable curve should be employed.

The method just described is usually sufficient; but it occasionally fails, and it is then desirable to adopt another, but slightly painful, expedient. The catheter, after reaching the posterior wall of the pharynx, is immediately rotated outwards through an angle of 90°; the outer extremity is then pressed towards the middle line, so that the point is kept against the lateral wall of the pharynx; in this position it is withdrawn until the instrument is felt to have glided over the prominent posterior cartilage of the tube into its orifice; a little further rotation outwards is now generally required to secure the insertion of the extremity into the lumen of the tube.

The two methods just described are sufficient for all practical purposes. As a matter of fact, the expert can almost always secure the successful introduction of the instrument, while the beginner usually meets with difficulty. Some authorities use the posterior margin of the palate as a guide instead of the nasal septum, as in the method first described, and, having felt the catheter hook upon it, push the instrument a little back, and then turn it outwards.

Whenever the catheter is, or is believed to be, correctly placed, it is kept thus by the fingers of the left hand while the nozzle of the bag is inserted into its outer extremity, and air forced through. In cases where there is no obstruction of the Eustachian tube the current is felt by the patient, and heard by the surgeon to impinge upon the drum-membrane. If a moderate amount of obstruction exists, the same effect is only distinctly produced by compressing the bag as the patient swallows. It may happen that while the instrument is correctly placed no air enters the middle ear, even though the tube be pervious; this may be due to some fold of mucous membrane covering the extremity of the catheter, and a very slight movement of the point will usually suffice to free it.

The sound heard on auscultating while air enters the tympanum is full, clear, and unmistakable when the tube is open. If it be narrowed the sound of impact against the membrane is much less marked, and to the experienced observer is preceded by a faint whistling sound. If there be fluid or mucus in the pharyngeal orifice a gurgling is heard but comparatively at a distance, while if there be much liquid in the tympanic cavity a faint moist sound immediately precedes the impact of air against the membrane. If this be perforated, the sound varies according as the orifice is large or small. In the former case the current seems to blow right into the observer's ear, while, if the opening be small, a whistling sound is heard.

Catheterisation of the Eustachian tube is not usually a painful operation. Before it is undertaken the patient should be directed to avoid contorting the face, as an associated contraction of the palate is then likely to cause the instrument to be grasped as it enters the naso-pharynx, and thus discomfort results. Sometimes the nasal mucosa is very sensitive, and if this be extreme, cocain may be applied previous to the introduction of the catheter. Some persons tend to retch when the instrument is felt in the naso-pharynx; rapid rotation and insertion of the extremity into the tube is, however, usually followed by a cessation of the inclination to vomit. Beginners occasionally introduce the catheter into the middle meatus of the nose. When this mistake has been made the instrument is not directed horizontally but upwards, and it cannot, as a rule, be rotated at all; attention to these points should enable the operator immediately to detect his error. In young children the catheter is rarely employed. When one nostril is impassible it has been proposed to catheterise from the opposite side by the introduction of specially constructed instruments. In most cases, however, this can be accomplished by passing an instrument with a large curve through the open nostril, hooking this on the septum, pushing it back a very little, rotating, and then pressing the beak towards the Eustachian tube. Unpleasant results from the introduction of the catheter are rare. I have, however, met with loss of consciousness, associated with convulsive twitching, as an effect of catheterisation. A number of cases of emphysema, due to entrance of air beneath the mucosa, have been recorded, but an example of this has never occurred in my hospital or private practice. If the instrument be manipulated so as to avoid abrading the mucous membrane, and if air be blown into the catheter gently at first, and the strength of the injections gradually increased, there can be little danger of extensive inflation of the tissues; a few instances of syphilitic infection have been recorded, and it cannot be too strongly impressed upon the practitioner that he ought (1) to make syphilitic patients supply their own instruments, (2) keep his catheters always standing in an antiseptic solution. As this is only possible with the vulcanite instruments, they are—if only for this reason—to be preferred.

Examination of the Eustachian tube may, in cases of obstruction, be conducted by means of *bougies* passed through the catheter. I do not think these instruments are of much practical value in diagnosis, because it is really not of any very great importance to ascertain the exact locality of an obstruction. Sometimes, however, after the passage of a bougie, air enters more freely. The instruments best suited for use are those with bulbous extremities, and made of celluloid as suggested by Urbantschitsch. Before employing a bougie, it is passed into the catheter, through which it is to be introduced, until its extremity reaches the end of the tube; an ink mark is now made upon the celluloid, at the point where it corresponds with the trumpet-shaped margin of the catheter. As the whole length of the Eustachian tube is about 1½ inches, another similar mark is made at this distance from the first. The intervening space is then divided into three equal parts, each of which thus corresponds to half an inch. It should be remembered that the narrowest portion (or isthmus) of the tube is situated at the junction of the osseous and cartilaginous portions, about 1 inch from the pharynx, and that it is rarely desirable to pass a bougie much beyond this. Having passed the Eustachian catheter, the marked bougie is introduced rapidly up to the first ink mark, and then pushed very gently and carefully onwards. The subjective sensations of the patient form the best guide as to whether or not the instrument is engaged in the Eustachian tube. In the former case a sensation will be experienced towards the ear. If there be marked obstruction or great pain the instrument should be withdrawn, and a smaller one substituted. At all events it is undesirable to introduce it much beyond the third ink mark (*i.e.*, 1 inch). After the bougie is withdrawn the point is carefully examined and if no blood be detected, a very gentle insufflation of air may be employed. Before leaving this subject I should like it to be distinctly understood that I in no way advocate the routine employment of bougies, for in most cases they are quite unnecessary, and unless great care be exercised their use may lead to emphysema.

After air has been driven into the middle ear by any of the methods described, it is most important to note the effects. The hearing power should be tested immediately afterwards, and then again after an interval of a few minutes, or after the patient has held his nose and swallowed a few times. This is necessary, as sometimes the excess of air within the tympanum causes a transient increase of deafness, which may afterwards give place to marked improvement. The effect of the insufflation upon such subjective sensations as tinnitus, vertigo, and stuffy feeling in the ears and head, should also be carefully noted.

Electrical examination of the auditory nerve is a method of diagnosis upon which the opinions of authorities are much at variance. Brenner was the first who attempted to frame a definite formula for the reaction of the nerve of hearing. According to him, when the negative pole is applied to the ear, and the positive electrode placed upon some remote region, a sensation of sound is caused by closing the circuit, and lasts until it is opened. If, on the other hand, the positive pole be connected with the ear, no sound is heard on closing, or during closure of, the circuit, but a slight reaction follows opening. It is now, however, commonly admitted that this typical reaction is by no means always discoverable in persons with healthy ears; indeed, Pollak and Gärtner seem to deny to the normal nerve any reaction whatever. Gradenigo has recently paid considerable attention to the electric reaction of the nerve, and seems to have found that in health it only responds to strong currents, 12-20 milliampères, the strength required varying according to whether the meatus be filled with tepid water or not, while in certain diseased conditions of the ear very much weaker currents suffice. Perhaps the most important statement of this author —if it should be confirmed—is the assertion that in gross cerebral lesions, not impairing the hearing, this excitability of the auditory nerve by weak currents is often observed.

As to the mode of applying the aural electrode, the most commonly employed method is to place the moistened pad over the tragus. Gradenigo, in addition, suggests filling the meatus with tepid water, while sometimes the electrode is introduced into liquid with which the canal is filled.

Both *posterior and anterior rhinoscopy* should be practised as part of the examination of most cases in which the middle ear is implicated, but as the subject has been already fully discussed, no further remarks are here necessary.

CHAPTER II.

GENERAL SEMEIOLOGY.

THE *symptoms* which commonly lead to an examination of the ear are deafness, tinnitus, or pain. As we shall see presently, however, there are other symptoms, which, when present, necessitate careful examination of the auditory apparatus, *e.g.*, vertigo.

Deafness in general we have already discussed in the preceding chapter. There are, however, certain anomalies of hearing to which no reference has been made. The most important of these is *Paracusis Willisii*—a symptom named after the observer who first studied it. When this condition is present the patient, who is usually very distinctly "dull of hearing" under ordinary circumstances, hears as well, or even better, than individuals with normal auditory apparatus when in the midst of loud noise. Such persons, for example, can follow conversation carried on in a railway carriage or cab with ease and comfort. It has been attempted to explain this anomaly on the assumption that conversation conducted under these circumstances is much louder than in a quiet room, but the phenomenon is in many cases so marked that there can be no doubt that another explanation must be sought. Some authorities believe that the symptom is due to extreme irritation of the nervous apparatus, which enables it for a time to fulfil its function more effectively, but as—so far as our present clinical knowledge goes—the paracusis of Willis is generally met with in cases of advanced middle ear deafness, the assumption that the effect of the loud sounds is to mobilise the tympanic structures, which are otherwise rigid, is more in accordance with probability; the explanation, according to this view, is that any additional vibrations are more readily perceived by the temporarily mobilised parts. Another, but less common, anomaly, is that known as *hyperæsthesia acoustica.* When this symptom is present certain sounds, especially those of high pitch, are followed by a painful impression. In conditions of general nervous irritability, whether functional or due to some gross lesion, *e.g.*, meningitis, this anomaly exists. It is, however, also met with in very deaf persons, and when addressing such individuals in a loud voice they occasionally complain of pain, and beg that a lower key should be employed. Politzer states that he has met with acoustic hyperæsthesia in individuals who were quite deaf. *Diplacusis,* or double hearing, is occasionally observed; the patient rarely in the case of words, but more commonly on hearing a musical note, perceives two sounds. When the anomaly extends to words, the mental picture produced is blurred; in the case of notes, two tones of different pitch are perceived. It is the fashion to ascribe this symptom to a change in the basilar membrane, but, as Gruber points out, the theory of Helmholtz is by no means absolutely proved. It is also the case that this phenomenon is relatively more commonly associated with symptoms pointing only to a middle ear disease, than with clinical evidence of a labyrinthine lesion. In unilateral deafness, and sometimes when the two ears hear unequally, a difficulty is experienced in estimating the direction of sounds, which is designated *Paracusis loci* by Politzer.

Tinnitus aurium, or a subjective sensation of sound in the ears, is a very common symptom. It may exist in any form of ear disease, but is least frequently complained of by patients with a perforated drum membrane. Curiously enough children, although very liable to middle ear lesions, rarely complain of this symptom.

We must here devote a few words to a consideration of the *etiology* of tinnitus aurium. In most cases the patients complain of hissing, rushing, beating, or whistling sounds, and closer inquiry usually leads to the observer being able to refer these subjective sensations either to the venous or arterial circulation. Thus the hammering sounds so often complained of will be found by the intelligent patient to be synchronous with the pulse, while it does not require a great stretch of imagination to refer rushing sounds to the venous circulation. It is of some interest to consider which vessels are actually responsible for the production of these auditory sensations. Tripier, who first called attention to the fact that in chlorosis a cephalic venous bruit can be heard over the region of the intracranial sinuses, also found that the tinnitus so frequently present in these cases disappeared before the stethoscopic phenomena. This observation points to the minute rather than to the larger vessels as the direct exciting cause of vascular tinnitus. As any inward pressure of the chain of ossicles is liable to excite tinnitus, I am inclined to ascribe the symptom to changes of tension in the labyrinthine fluid, whether plus or minus; this change of tension causes the labyrinthine circulation to be felt. An exactly parallel case is that of the heart beat; the pulsations of health are not perceived, but let them be weakened as in threatened syncope, or strengthened, as after great physical effort, and they are not only acutely but even painfully felt. In most cases of ear disease in which tinnitus is a prominent symptom, a change of tension in the tympanic apparatus exists, which change must be communicated through the chain of ossicles to the membrane of the fenestra ovalis and labyrinth. It must, however, be remembered that tinnitus, due to alterations of vascular tension within the labyrinth, may arise from changes in—(1) The condition of the vessels, *e.g.*, dilatation, contraction, increased tension (as in Bright's disease), or atheroma. (2) The condition of the circulation, *e.g.*, local interference with the cerebral circulation or general circulatory disturbance, *e.g.*, in heart disease. (3) The quality of the blood, *e.g.*, lithæmia and anæmia. Certain drugs, such as quinine, the salicylates, and nitrite of amyl may also produce the symptom in question. The two first, in all probability, act by contracting the vessels and causing labyrinthine anæmia, for in recorded cases of amblyopia resulting from these drugs, the disc has been found intensely anæmic. I am aware that this statement is opposed to the teaching of Roosa and Kirchner, but the observations of these authorities permit of another interpretation, as I have elsewhere pointed out. In the case of nitrite of amyl the vessels of the internal ear are probably dilated in accord with those of other parts. Alcohol may also cause tinnitus, and probably acts both by influencing the circulation as a whole, as well as by its effects upon the tonicity of the cerebral vessels. In certain cases tinnitus is reflex, and whether in these cases the actual cause is to be sought in direct irritation of the auditory centre, or in vasomotor influences, is uncertain; among causes to which reflex tinnitus has been traced may be mentioned dental caries. Intracranial tumours may cause the symptom in question, either by pressing on the auditory nerve or by interfering with the circulation of the internal ear.

Although I believe that vascular tinnitus is by far the most common variety of subjective auditory sensation, yet there are no doubt other forms. Thus, Gottstein observed a case of blepharospasm, associated with tinnitus in such a manner as to justify a diagnosis of co-existing spasm of the stapedius muscle, which is also supplied by the facial nerve; while instances of spasm of the tensor tympani, with resulting tinnitus, have also been recorded. Again, choreic twitching of the palate, associated with clicking in the ear, is sometimes met with; but in these cases the sound is audible to bystanders, and therefore objective. Again, in cases where free fluid is present in the middle ear, various gurgling and bubbling sounds may be heard by the patient.

According to Brunner, the auditory nerve as a whole may react to loud sounds, electricity, or pressure applied directly to the stapes, with resulting tinnitus of a high metallic pitch different from any of the forms just described. I can, from personal experience after a slight gun accident, confirm this observation, and, in intelligent patients, the presence of this intensely high-pitched tinnitus may occasionally be a point of value in diagnosis.

It need hardly be mentioned that murmurs, due to gross changes in the arteries near the ear, may be perceived as tinnitus by the patient, while they can also be heard by the physician. Endocranial aneurisms are the only conditions of this kind which are liable to be overlooked.

I have briefly referred to causes of tinnitus outside of the domain of the otologist, because it seems advisable that the practitioner who examines a case of this kind should have every possibility before him. It only remains to refer to auditory hallucinations, such as the hearing of melodies, and human or animal voices. The first mentioned I have seen in cases of ear disease, where no suspicion of the patient's sanity could for a moment be entertained. In both cases the immediate cause must probably be sought in the cortical centres.

Perhaps this is the best opportunity of referring to the *treatment* of tinnitus when due to ear disease. Obviously the best method would be to cure the ear disease; this, however, is unfortunately not always possible. The general health of the patient must then receive attention, and, if necessary, treatment. In incurable cases of ear disease, I believe that the best results can often be attained by explaining to the patient that the subjective auditory sensations are fully accounted for by the local condition, and advising him to disregard the tinnitus as much as possible, and on no account to listen for it. At the same time a change of air and scene should be recommended, with the advice to keep himself employed in some interesting pursuit. When this line of treatment does not suffice, and if the symptom be intolerable, recourse must sometimes be had to nerve sedatives. Of these I believe the bromides of potassium, sodium, and ammonium are the best. At the same time, these drugs should only be prescribed during almost unbearable exacerbations; were this rule not followed, many persons with chronic incurable ear disease would have to consume bromides daily during their whole lives. Certain more or less empirical remedies may also be employed. Thus Türck found that occasionally tinnitus is relieved by pressure on the mastoid process and seventh cervical vertebra, hence the effect of rubbing these parts with stimulating or sedative liniments may be tried. Weil, again, observed that blowing on the walls of the meatus may have a similar effect. Exhausting the air in the meatus with Delstanche's rarefacteur has also been employed. Instillations of sedatives into the meatus, or their application on pieces of cotton wool, are often recommended. The injection of drugs through the Eustachian catheter has also been tried. Thus Lucæ used chloral hydrate, while more recently Kiesselbach has recommended a few drops of a solution of cocain (4-10 p. c.); the latter seems, however, to have been often followed by severe giddiness and other symptoms, such as vomiting. Menthol vapour, inflated by Valsalva's method, may be tried, or a few drops of an oleaginous solution may be driven through a catheter. It would serve no good purpose to go over in detail all the remedies which have been employed to combat this distressing symptom; for most, if not all of them, are useless in obstinate cases, while in hysterical individuals, any remedy, if only administered with sufficient assurance, may effect a cure. In persons of very neurotic temperament, it is not unlikely that something might be effected by hypnotism; but this subject requires further investigation. Electricity has been much vaunted as a cure for tinnitus. No doubt, in certain cases, the constant current does good for a time, especially if the positive pole be applied to the ear while the number of cells in action is gradually increased, and again diminished to one before the circuit is broken; but, contrary to the experience of Althaus, I have never found the results permanent. The interrupted current, as recommended by Field, is, in my experience, still less effective. Lucæ has suggested exposure of the ear to the tones of a high-pitched tuning-fork, in case the subjective sensation is of low pitch, and *vice versa;* but this method of treatment does not seem to have been much employed.

Pain is an important symptom in certain forms of ear disease. Thus in acute inflammation of the meatus and middle ear it is commonly marked. When the cause of pain is situated in the meatus, the symptom is usually increased by pulling the auricle, and by movements of the jaws. In middle ear cases, on the other hand, anything which tends to change the tension of the air on either side of the drum membrane increases it, *e.g.*, blowing the nose, or sudden pressure inwards on the tragus. In cases of chronic suppuration of the middle ear, pain is a symptom of very grave importance. Reflex neuralgia in the region of the ear is comparatively common as the result of carious teeth, while it also occurs in connection with ulceration of the tonsils, pharynx, larynx, and even naso-pharynx. In malignant and tubercular conditions of the larynx it is frequently present.

Occasionally ear disease gives rise to disturbances of the nervous system, the most common and important of which is *auditory vertigo.* In a purely clinical manual it would, I think, be out of place to enter at any length upon the physiology of the semicircular canals. From the time of Flourens, it has been admitted by all but a few observers, that lesions of the canals are followed by disturbance of equilibrium. Menière was the first to associate intense and sudden vertigo, accompanied by tinnitus and deafness, with disease of the labyrinth, and it has, therefore, become customary to speak of all auditory vertigo as Menière's disease. This nomenclature has led to confusion in the past, and, if it be persisted in, will continue to do so in the future. It cannot be too strongly emphasised that Menière's disease, or, to be more exact, the symptoms described by Menière, represent only one form of auditory vertigo—to wit, where a sudden lesion of the labyrinth is the pathological cause. If it be remembered that any pressure on the tympanic membrane is liable, by moving the chain of ossicles inwards, to alter the tension of the labyrinthine fluid, it will not surprise the observer to meet with giddiness, due to the pressure of a piece of wax on the drum-head, or forcible syringing. In the same way, a little consideration will show that any middle ear disease may give rise to a similar change of tension in the fluid which fills the semicircular canals.

The *symptoms* of a typical attack of auditory vertigo are somewhat as follows:—The patient suddenly complains of tinnitus and intense vertigo, he falls, if not supported, usually—if not always—towards the side of the affected ear. After lying down, either because the giddiness abates slightly, or because the sufferer has recovered from the first shock of the attack, he notices that surrounding objects seem to be moving in some definite plane. Nausea and vomiting, with cold sweats and weak pulse, then set in, and usually the vertigo gradually passes off. Occasionally consciousness is lost for a time, but I have only met with one case where the history made this certain. It is of some interest to note the sequence of events; the vertigo is evidently the first effect of a stimulus applied to the nerve endings in the ampullæ of the semicircular canals; the irritation is carried through these nerves to a central area, which, when stimulated, gives rise to the sensation of giddiness; the stimulus in severe cases is, however, sufficiently powerful to affect other centres physiologically connected, and thus we can account for the vomiting and tendency to syncope as evidenced by the cold sweats and weak pulse.

A more commonly encountered form of auditory vertigo is that in which the symptom is more or less constantly present, but never extremely severe, although it may be sufficiently marked to make the patient stagger when walking. In slight cases even this phenomenon is not observed, and giddiness is only experienced when the patient turns round or stoops suddenly. Auditory vertigo is not common in children, excepting after cerebro-spinal meningitis. Indeed, very young subjects do not seem to suffer from it in connection with lesions confined to the meatus and middle ear, while chronic tympanic affections are the most common cause of the symptom in adults. It is important not to ascribe every case of vertigo occurring in connection with ear disease to peripheral stimulation of the auditory nerve in the ampullæ; for, as we shall see in a later chapter, chronic suppuration of the middle ear may lead to gross changes in the cerebellum, and thus cause both vertigo and vomiting.

The *diagnosis* of auditory vertigo from cerebellar disease generally, can only be arrived at by a careful consideration of each case on its merits, for there is every reason to believe that the giddiness resulting from ear disease is ultimately a cerebellar phenomenon. From gastric vertigo it can usually be distinguished by the fact that, in the auditory form, nausea and vomiting, if present, follow the giddiness. At the same time, ripened experience has shown me that there is a very close connection between the two; thus, many persons with chronic ear lesions, which give rise to occasional attacks of giddiness, may bring on such an attack by an indiscretion in diet. Politzer asserts that in auditory vertigo equilibration is worse when the eyes are shut, but, although I have sometimes observed this, I do not think it is by any means the rule.

The *prognosis* depends upon the condition of the ear. If the aural affection be of such a nature as to irritate without paralysing the auditory nerve (*e.g.*, chronic middle ear catarrh) the tendency to vertigo usually lasts for long. On the other hand, if there be a distinct destructive lesion of the labyrinth, the vertigo, while more severe at first, passes off more quickly. In any case it is not usually possible to insure the patient against a repetition of the attack.

As to *treatment* little need be here said. The obvious indication is, if possible, to cure the ear disease, and, failing this, to palliate the symptoms. In those who are liable to auditory vertigo, scrupulous attention should be paid to the general health, any tendency to neurasthenia or digestive disturbance being specially combated. For the relief of the vertigo the bromides are the best remedy, given, if need be, in large doses.

Kipp and others have described *nystagmus* due to ear disease. This symptom is readily explained by physiological experiments, which indicate that stimulation of a semicircular canal produces movements of the eyes in the plane of the canal operated on.

A symptom very commonly met with in various forms of ear disease is a sensation of *pressure or weight in the head.* This is prone to lead to incapacity for continued mental effort, and, occasionally, even to loss of memory. Here, too, if all else fails, the bromides are sometimes successful.

A few cases of *reflex epilepsy* and of mental derangement have been met with, in which these conditions were secondary to, and caused by, ear disease.

Irritation of the external auditory meatus may give rise both to *cough* and *sneezing,* due to stimulation of the auricular branch of the pneumogastric, which supplies the walls of the canal.

Anomalies of taste are not uncommon, owing to the fact that the chorda tympani, which is the gustatory nerve of the anterior portion of the tongue, lies free in the cavity of the tympanum, and is thus exposed to the action of inflammatory processes involving the drum.

Headache, more or less intense, may be associated with acute or more especially chronic suppuration of the middle ear, and is then often a symptom of grave significance. Legal, however, states that he has met with occipital neuralgia and headache in cases of chronic Eustachian obstruction and tympanic catarrh—conditions usually quite unassociated with pain. The usual treatment directed to the nose, throat, and ear, including injection of air into the tympanum, gave relief in his cases. I have also found very slight middle ear catarrh in patients whose chief complaint was diffuse headache, and, in some of these, relief resulted from inflating the middle ear; but, as the subjects were chiefly neurotic individuals, I do not attach much importance to the results obtained.

Walker Downie, and after him Herzog, have recorded cases in which *irregular action of the heart* could be traced to aural affections, such as the presence of wax and polypi; but this symptom is, judging from my own experience and the writings of others, extremely rare.

CHAPTER III.

GENERAL THERAPEUTICS.

In a previous chapter the various means by which compressed air may be driven into the middle ear have been fully discussed. It must, however, be remembered that these and other methods already considered, *e.g.*, the introduction of bougies into the Eustachian tube, and the application of electricity in ear disease, are employed for therapeutic as well as for diagnostic purposes.

In a number of cases, general, as well as local, treatment is required. Thus the aurist will find his special methods succeed better if the general health of the patient be good, and we shall see later that anæmia, struma, rheumatism, and other diseases may predispose to aural affections. In catarrhal cases the same general line of treatment is desirable, as in similar lesions of other parts, indeed, middle ear catarrh is usually secondary to naso-pharyngeal disease, and I must therefore refer the reader to what has been said as to general hygienic regimen with regard to nasal therapeutics. In certain chronic forms of deafness, climate exercises a marked effect upon the malady; thus the victims of advanced chronic non-suppurative middle ear inflammation are often much benefitted during a residence in a dry atmosphere; while, as a rule, seaside resorts are not well tolerated in middle ear catarrh, a fact especially emphasised by Moure. Again, in suppurations of the ear which show themselves obstinate to treatment, a wonderful improvement at times follows a change of air and scene. Having thus dismissed, in a few words, subjects to which we shall have occasion to recur in later chapters, let us turn to a consideration of local therapeutics.

SYRINGING THE EAR.

For this purpose a surgical syringe with a somewhat fine nozzle will be found efficient. It is advantageous to have the instrument furnished with rings into which the operator's fingers are inserted while pressing down the piston. In certain cases, where the matter it is desired to remove is fluid, the small syringes of glass and indiarubber, sold by chemists, may be effectual, but their use is not generally to be recommended.

When it is desired to syringe an ear, the patient is so placed that light falls upon, or can be reflected on, the part. A towel is placed over his shoulder, and he is directed to hold a vessel tightly against his neck, at a level of about an inch below the auricle. For this purpose a small china bowl is all sufficient. The operator then pulls the auricle upwards and backwards, and injects the fluid from the syringe either along the upper or lower wall of the meatus. Before employing the syringe it is well to have all air removed from the instrument—an object which is easily accomplished by holding the nozzle directly upwards, and pressing the piston until fluid escapes.

The liquid employed for syringing should be tepid or warm, according to the taste of the patient, but never quite cold. It is desirable not to employ water alone, as in the event of there being a perforation of the membrane, it acts as an irritant on the mucosa of the tympanum. This result is more or less obviated by adding common salt in the proportion of a teaspoonful to a pint. In my own practice—both private and hospital—I always employ a solution of boracic acid which has the additional advantage of being antiseptic.

In most cases it is desirable not to continue syringing after the process has became painful. This rule applies with special force to cases in which the operation is undertaken for the removal of wax, eczematous products or plugs of epithelium, as all those substances can be softened by the instillation of an alkaline solution, and violent syringing may be followed by inflammation of the meatus, and even of the middle ear. If undue force be employed in forcing the fluid into the ear, considerable giddiness may ensue; as a rule this readily passes off. In certain cases of chronic middle ear suppuration the patients complain of severe giddiness, even after the mildest syringing; such attacks last commonly only for a short time, and in as much as cleanliness is in many of these cases a vital necessity, we must often choose the minor evil, and direct the patient to continue syringing in spite of his discomfort. From the Berlin school of surgery there has recently emanated an outcry against syringing in cases of septic otorrhœa (and all chronic aural suppurations are septic); but as the learned author did not suggest a satisfactory alternative method, we are obliged to ignore his theoretical strictures.

In order to remove inspissated masses of pus from the interior of the tympanum, Hartmann has suggested the employment of small tubes passed through the perforated drum-membrane. My own experience with this method has been unsatisfactory, and I prefer in such cases to trust to alkaline instillations, the employment of the digestive ferments (Benger's liquor pancreaticus, or a 5 per cent. solution of papain, as suggested by Mackenzie Johnston), as eardrops, and injections through the Eustachian catheter. After the ear has been syringed it is desirable to remove superfluous fluid, which is best accomplished by the introduction of a wick of absorbent cotton wool. This may be done by the surgeon, with the aid of a speculum and reflector, but, inasmuch as syringing is often carried out at home, it is desirable to prescribe a feasible method of drying the ear. When syringing at home is ordered, it is extremely important that the actual injections should be carried out by a person instructed in the method by a medical man, because the individual himself cannot pull back the auricle, and, at the same time, hold both basin and syringe. The drying out should, however, be left entirely to the patient, who takes an ordinary wooden match, dips the non-luminous extremity into water, and wraps round it a piece of absorbent wool, projecting well beyond the extremity, and introduces this deeply, but gently, into the ear. When the drum-membrane is touched by the soft wool, he withdraws the improvised brush and throws it away. In cases of perforated membrane it is desirable to force air through the tympanum from the nose in order to drive any fluid into the meatus, where it can be mopped up in this way. After the ear has been syringed it is, in my opinion, always well to insert a small piece of cotton wool into the meatus, to guard against irritation from cold or other agents. In cases where there is a tendency to eczema, plugs of this kind should always be saturated with vaseline or some other unguent.

In certain cases injections are made into the tympanum by way of the Eustachian tubes. This operation is really useful in cases of chronic middle ear suppuration with inspissated pus; it is, as a rule, useless when employed with a view to removing chronic thickening within the tympanum, although some—indeed, many—aurists still employ it. In the latter case only small quantities of fluid are injected. The catheter is introduced in the usual way, only an instrument is chosen with a considerable curve and wide lumen. The operator has placed above his ear, in order to leave his hands free, a small syringe, about as large as that used for hypodermic injections, but having a nozzle which fits air-tight into the outer end of the catheter. When the last-named instrument has been introduced, the syringe, containing a few drops of liquid, is emptied into it, and the fluid driven in by the air bag. In this way solutions of iodide of potassium (gr. 5-10 ad. ℥i.), of bicarbonate of sodium, and of countless other drugs, have been, and are, employed, with a view to making them accomplish the—as I think—impossible task of causing disappearance of hyperplastic tissue.

In cases of chronic suppuration with perforated drum-membrane much larger quantities are used. In these cases either the same small syringe may be filled and emptied several times, followed on each occasion by the use of the air bag, or a large syringe may be employed with a nozzle adapted to the trumpet-like orifice of the catheter. It is important to have the catheter well in position, with its curved extremity actually engaged in the lumen of the tube, before injecting any very large quantity of fluid in this way, otherwise the liquid is liable to cause choking by falling into the larynx. I have also found it desirable in such cases to make the patient sit with the affected ear down, to enable the solution to flow more readily through the perforated membrane into the meatus. For this method I generally use a solution of boracic acid, but other antiseptics or solvents (*e.g.*, solution of bicarbonate of sodium) may be employed in the same way.

Gruber has suggested another method of introducing quantities of liquid into the middle ear. He employs a syringe with an olive-shaped nozzle, which, when introduced into the nostril, completely fills it. If this syringe be emptied into one nostril, while the other is occluded by the pressure of the operator's fingers, the injected fluid, by causing reflex elevation of the palate, finds its way towards, or into, the tympana of both sides, according to the force with which it is injected. The employment of this method must, however, be restricted to cases where it is desired to inject both sides.

EMPLOYMENT OF MEDICATED SOLUTIONS INTRODUCED INTO THE MEATUS.

When it is desired to introduce fluids into the meatus in the form of ear drops, certain directions require to be given to those who are to carry out the treatment.

In the first place, liquids employed in this way require to be warmed, excepting rectified spirits. The quantity employed is usually immaterial, but half-a-teaspoonful will be quite sufficient for most cases; while, if it be desired to act only on the tympanic mucosa through a perforated drum-membrane, a smaller quantity will suffice. In introducing toxic substances, it is always necessary to bear in mind that in cases of perforation a certain amount of the drug will be absorbed, while another portion may find its way into the pharynx and be swallowed.

It is important, further, to consider that both the external meatus and the drum-membrane are delicate and sensitive parts, and that therefore the introduction of irritating substances may be followed by disastrous inflammation. When ear-drops are to be applied, the patient must sit with his head to one side, the ear to be medicated upwards. The auricle is then pulled well backwards and upwards, and the liquid poured into the meatus, and immediately afterwards the tragus is pressed upon so as to drive the fluid inwards. In the case of small apertures in the membrane where it is desired to introduce the fluid into the middle ear, this may be facilitated by making the patient hold the nose and swallow.

Gelatine Bougies.

Gruber has suggested the employment of almond-shaped pieces of gelatine, specially prepared so as to liquefy at the body temperature, and impregnated with various substances, as a method of introducing medicinal agents. The only drug which is well employed in this manner is extract of opium, in furuncles of the meatus. In cases of chronic or acute middle ear suppuration, I consider these gelatine preparations as undesirable, owing to the risk of their interfering with free drainage.

Introduction of Vapours into the Middle Ear.

It is sometimes desired to introduce vapours into the middle ear by way of the Eustachian tubes. This may be effected in most cases—after patency of the tubes has been attained—by directing the patient to fill his mouth and throat with the vapour, and then perform Valsalva's experiment. In this way chloride of ammonium and iodine inhalations are often used—the former by means of Godfrey's inhaler, while the latter may be employed by adding twenty minims of the tincture with an equal quantity of acetic ether to a pint of hot water, and inhaling the steam in the manner just described.

Continental authorities deprecate the therapeutic use of Valsalva's method, and advocate the introduction of vapours through the Eustachian catheter. Volatile substances, such as turpentine, acetic ether, etc., may be injected by inserting the nozzle of a compressed bag into the mouth of the bottle, and thus filling it with the fumes, which are then driven onwards through the catheter. If a bottle containing iodine be gently heated, the vapour may be used in the same manner.

INTRODUCTION OF POWDERS.

In cases of chronic suppuration, the insufflation of antiseptic powders, such as boracic acid, iodol, iodoform, and other substances, is very widely—and, as I think, too indiscriminately—employed.

Before making up his mind to adopt this method of treatment, the surgeon ought to assure himself that the introduction of the powder is not likely to interfere with free drainage. It is, therefore, from my point of view, objectionable in chronic suppuration of the middle ear with a small perforation, because, although it may materially hasten the cure in certain cases, in others, as I know from experience, this treatment may be the direct exciting cause of mastoid inflammation. It seems desirable to touch upon this point here, because I do not think that the treatment of ear disease by the insufflation of powders should ever be referred to without a word of warning.

The introduction of the powder is easily accomplished, either in operating on the meatus (incising furuncles and the like) the only possible method would be an ether spray, or the hypodermic injection of cocain; for this drug does not seem to take effect upon dermoid surfaces when applied otherwise. From the records of authors a certain amount of anæsthesia of the drum-membrane can be obtained by allowing a strong solution of cocain to remain in contact with it for some time. In acute middle ear inflammations the action of glycerine, containing 10 per cent. of cocain, and a similar quantity of carbolic acid, is most marked in relieving pain.

Whenever the mucosa of the tympanic cavity is exposed, anæsthesia can, with certainty, be obtained by the instillation of cocain in solution; but this drug seems frequently to cause toxic symptoms when applied to the mucous lining of the drum. As a general rule, therefore, slight operations are performed without anæsthesia.

OPERATIONS.

It is not my purpose, at this stage, to describe in detail operative methods, which will be better discussed in subsequent chapters. I shall, therefore, content myself with describing some of the instruments in common use.

Knives.—For incising the walls of the meatus a small tenotomy knife is sufficient. In some cases, however, it is advisable to have for the purpose a very small curved and sharp-pointed bistoury.

For incising the tympanic membrane, I prefer the small knife known as Gruber's to any other.

It will not be amiss here to refer to the general shape of instruments to be employed in operating on the deeper structures of the meatus. These should be bent at an angle of rather over 90°, so that the operator's hand may not encroach upon the lumen of the speculum. It is, therefore, desirable to have the various instruments, which will be afterwards mentioned, adjusted so as to fit a common handle, with which they form the desired angle. The handle should be roughened and not too delicate.

Forceps. — In order to introduce cotton wool into the meatus, or to remove small pieces of epidermis or wax, a delicate forceps with a knee-shaped bend is employed; such an instrument is contained in every case of ear instruments. These forceps are, however, deficient in grasping power, and, therefore, a variety of stronger instruments have been made, all having the same bend. Excepting as an occasional aid to the removal of foreign bodies or polypi, they are seldom required. Such elaborate instruments as Toynbee's lever-ring forceps are no longer necessary, in view of our improved methods of illumination and operation.

Snares.—Various forms of cold wire snare are employed in order to remove polypi. Most aurists have taken upon themselves to modify, in some form or other, the original instrument as first suggested by Wilde. What particular shape or form of instrument is used matters not at all. It is, however, of great importance that the extremity should be as delicately wrought as possible, for in many cases success will depend upon the operator's eye being able accurately to follow the wire loop. In the case of large growths it is well to use fine iron wire, but when the polypus is very small, and the parts sensitive, delicate silver or copper wire is preferable.

Sharp and Blunt Hooks.—These need no description, as they are similar to the instruments employed in general surgery, only in miniature. The blunt hook is more often used, but in the case of peas or other soft substances being wedged in the meatus, the sharp instrument may be almost indispensable.

Sharp Spoons and Curettes.—Sharp spoons were first advocated by Wolff, and are now extensively employed by Trautmann. They may be used to remove granulations, to scrape the surface of carious bone, and even to remove portions of the tympanic structures which are interfering with drainage.

The ring knife is simply a flat circle of steel, the inner edge of which is sharp. This instrument, introduced by Politzer, is sometimes extremely valuable in effecting the removal of polypi which the snare cannot be made to encircle.

CHAPTER IV.

DISEASES OF THE EXTERNAL EAR.

UNDER this heading are included the auricle and external meatus. As the former is freely exposed to sight and touch, it requires no special knowledge to study its diseases. I shall, therefore, dwell very shortly upon this subject.

THE AURICLE.

Malformations.—It is well known that the angle formed between the posterior surface of the auricle and the mastoid region is liable to variations. In those who wear head dresses calculated to press the ear against the skull, this angle may become much reduced, and it has seemed to me that the constant approximation of the cutaneous surfaces is prone to produce eczema, while, as the late Dr. Cassels pointed out, it also contributes to narrowing of the cartilaginous meatus. The reader can easily verify the latter observation by introducing a finger into the meatus and pressing the auricle inwards, when a distinct contraction of the canal can be felt. Very rarely instances are met with where an actual adhesion has taken place between the upper and posterior part of the auricle and the adjacent skin of the head.

The treatment in these cases must be conducted on general surgical principles, *i.e.*, removing the cause of the malformation; in cases where adhesions have formed, operative interference is not called for, unless on æsthetic grounds.

The surgeon is occasionally consulted because of undue prominence of the auricle, which may be so marked as to disfigure the patient. An attempt may then be made to improve matters by means of a specially-constructed cap. In football players the auricles, if prominent, are prone to be torn in what is technically termed a "maul." Such a cap is then essential for the comfort of the patient if he desires to continue a player. Some authorities have advocated operative procedures, with a view to diminishing the prominence of the auricle. Thus Gruber advises that a portion of cutis be removed from the posterior surface of the auricle and adjacent mastoid region, and that the margins of the wound be stitched together.

In exceptional cases certain parts of the auricle are absent, and occasionally the deformity is so great that it is difficult to identify the portions which are present. Sometimes this deformity is bilateral. In such cases of rudimentary auricle the meatus is usually absent, while the tympanic and labyrinthine structures may also be in a state of arrested development.

In the way of treatment little can be done, unless, indeed, the offending ear be amputated, and an artificial auricle of pasteboard be worn as a substitute. The question, however, may arise as to the desirability of attempting to establish an auditory canal where this does not exist. As a rule, the obstruction is osseous, and, besides, we have no certainty that the rudimentary ear corresponds in position with the tympanic structures; it is, therefore, commonly unwise to attempt surgical interference.

Occasionally we meet with cases where certain portions, or even the whole auricle, are reduplicated. Such excrescences may be amputated, if the patient desires to have his deformity removed.

As *fistula auris congenita*, authors have described a small foramen which, when present, is usually found in the ascending part of the helix. This orifice leads into a fine canal having a blind ending, the walls of which secrete a thick creamy secretion. According to Urbantschitsch, the orifice sometimes becomes occluded, and a fluctuating tumour may then result. The congenital fistula is assumed to be the remains of the first branchial cleft.

Accidental Injuries.—As these are to be diagnosed and treated on general principles, it will be sufficient to name those which have been met with, viz.:—Contusions, incised wounds, burns, chilblains, and frost bite. It is hardly necessary to mention that such injuries may be followed by more or less violent inflammation.

Inflammations and Skin Diseases.—Simple diffuse inflammation of the whole auricle may result from injuries and other causes.

If the cartilage be involved in the inflammatory process, great pain results, followed by abscess formation, while even with careful treatment considerable deformity, due to destruction of cartilage and subsequent shrinking of the part, may result. According to Knapp, in cases of perichondritis, the lobule is usually not involved in the inflammatory process.

Gangrene of the auricle is fortunately a very rare disease, although Wilde described it as common in certain parts of Ireland.

Erythema, erysipelas, the rash of measles, scarlatina, and smallpox, may affect the auricle in the manner which characterises these affections respectively.

Of skin diseases eczema is undoubtedly the most common, while herpes, and other forms of eruption may also be met with. The treatment of these conditions must be conducted on the principles laid down in works on dermatology.

Lupus may invade the auricle, while occasionally this region is the seat of the characteristic eruptions of syphilis. I have also seen very deep and destructive ulceration of the auricle in the last named malady.

Neoplasms and Tumours.—In gouty subjects, as is well-known, urates may become deposited in the auricle, as pointed out by Garrod. Rarely the auricular fibro-cartilage undergoes partial ossification.

Cysts have been described by various authors, *e.g.*, Wilde, Meyer, Hartmann, and others. Fibrous tumours are not infrequently met with in the African races; these, as a rule, grow from the lobule, and may attain an immense size.

Othæmatoma.—This subject requires more than a passing notice, because in general medical literature it has received somewhat scant treatment. Described from the pathologist's point of view, the affection consists of an effusion of blood, either into the substance of the cartilage or between it and the perichondrium. From the comparatively common association of this lesion with insanity, the term "insane ear," has sometimes been applied to othæmatoma. There can be no doubt that hæmatoma of the ear is most commonly met with in the inmates of asylums; at the same time cases have been recorded —*e.g.*, by Chimani—where the spontaneous occurrence of a blood-cyst upon the auricle was unassociated with any other manifestations of disease. It is proved by the researches of such authorities as Virchow, Meyer, Pollak and others, that in certain individuals—especially the insane, the old, and the dyscrasic—softening processes occur in the cartilage of the auricle. If a person with this peculiarity has the slightest violence applied to the ear, it is manifest that an effusion of blood may ensue. It is equally certain that where such degenerative changes are in progress, a stage may be arrived at where spontaneous hæmorrhage is likely to occur. A sufficiently severe injury may, however, produce a sub-perichondrial effusion of blood in a perfectly healthy person, but in this case, considerable inflammatory reaction is likely to ensue as well. We have thus a natural classification into (1.) spontaneous hæmatoma (2.) traumatic hæmatoma. The appearance of the former is usually unassociated with any marked symptoms, excepting occasionally a sensation of warmth or tension. A more or less tense, fluctuating tumour shows itself on the anterior surface of the auricle. The colour of the swelling may correspond with that of the surrounding integument, or may have a distinctly bluish tinge sometimes the surface is quite smooth, indicating that the blood has been poured out immediately beneath the perichondrium; when effusion has occurred into the substance of the cartilage the outline is, however, more uneven.

In traumatic cases there is, of course, added the element of pain, and commonly there is also marked inflammatory reaction, causing the case to resemble in its clinical aspect one of perichondritis; indeed the effusion of blood is then usually associated with inflammation of cartilage.

In hæmatoma the effused fluid may be absorbed entirely, a cavity containing yellow or pinkish serum may be left, or considerable shrinking of the cartilage with deformity may result. In the traumatic form suppuration and necrosis of cartilage may lead to considerable loss of tissue; but in the spontaneous form, unless as a result of surgical interference, inflammatory reaction is not usual, and the shrinking process is probably dependent upon the defective condition of the cartilage which originally predisposed to the hæmorrhage.

The *treatment* of hæmatoma auris is a subject upon which authorities are by no means agreed. Thus Gruber advocates evacuation of the blood by means of a trocar if it be fluid, or by incision if coagulation has already occurred. After the swelling has thus been reduced, compresses and bandages are applied in order to prevent deformity. Other authorities prefer expectant treatment, aided by such applications as lead lotions and tincture of iodine. Meyer and Blake have recorded good results from massage. In the traumatic variety cold applications are most suitable; should tension occur, a free incision is, of course, indicated, while the case is treated generally on surgical principles, which require no special comment.

Angiomata are occasionally met with on the auricle, and vary in size from a pinhead to considerable tumours.

Malignant disease sometimes attacks the auricle in the form of epithelioma, and is then diagnosed on general principles.

Horny growths are sometimes met with upon the ear. They have been described by Pomeroy, Buck, and Burnett, and I have myself met with an example. According to Jamieson these growths are due to the eversion of a sebaceous follicle, which produces from its exposed surface the horn-like growth. As this author points out, removal of the horn-producing base is necessary to effect a cure.

THE EXTERNAL MEATUS.

Circumscribed Inflammation or Furunculosis.—Boils may occur in the external auditory meatus only, or they may be found in this situation, as well as upon other parts of the body.

A number of causes are usually stated in text-books to be capable of producing aural furuncles, but, to use the words of Urban Pritchard, " except when they result from diabetes, change of diet, debility, or such like, it is not known with accuracy what these conditions are." Recent bacteriological researches have, however, made it clear that the actual exciting cause is the entrance of a staphylococcus, which may penetrate through an abrasion or by way of a hair follicle or ceruminous gland. The common occurrence of furunculosis in a meatus which has been rendered irritable by the presence of chronic eczema is thus easily explained, for the organism is then probably introduced by the finger-nail in scratching. The occasional occurrence of boils as a complication of chronic suppuration can also be accounted for by the septic character of the discharge which flows over the walls of the meatus. The irritation caused by certain applications to the ear, such as alum and nitrate of silver, is also considered by authorities to be a possible cause of furunculosis, while the ailment is often ascribed by patients to catching cold. According to Gruber the prolonged use of bromide of potassium may cause circumscribed inflammation of the meatus. Occasionally the affection occurs in an epidemic form; such epidemics were observed by Bonnafont in Paris, and by Gruber in Vienna. Reviewing the etiology of furunculosis generally we must come to the conclusion that it depends upon the following factors, to wit—(1) The presence of a micro-organism; (2) The admission of such micro-organism below the epidermis, either by way of an abrasion, gland, or hair follicle; (3) a constitutional state favourable to the growth and development of the staphylococcus. The last-named condition may depend upon anæmia in one person and digestive disturbances in another. Occasionally, however, no fault can be detected in the general health of the patient. Furuncles of the meatus are most common in spring and autumn, while the patients are usually past the age of childhood.

The *symptoms* of furunculosis of the meatus vary. As a rule, the affection is associated with marked pain, which may precede the actual presence of a detectable objective lesion. This pain is increased by movement of the auricle or jaws, and may be associated with more or less marked febrile disturbance. It is quite common for one or more boils to be present at the same time, and frequently the subsidence of one furuncle is followed by the appearance of another. In such cases the patient gives a history of repeated attacks of pain, lasting from two or three days to a week, and followed by temporary relief after the occurrence of a discharge. This recurrence of furuncles may extend over weeks and months, so as to materially weaken the sufferer. The hearing is not necessarily affected, but after the boils have burst or have been artificially evacuated, an accumulation of inflammatory products may lead to temporary impairment of the auditory function. If two or more boils exist at the same time, considerable deafness may also result from temporary obliteration of the lumen of the auditory canal.

The surgeon should, however, bear in mind that the *prognosis* of impairment in hearing, resulting from furunculosis, is always favourable. The boils are almost always confined to the cartilaginous portion of the meatus, and beyond slight transitory congestion of the membrane, little or no danger of involvement of the tympanic structures exists.

On inspecting the meatus of a patient afflicted with boils, the lumen of the canal is seen to be encroached upon by one or more swellings. The inexperienced observer may not immediately recognise these as boils, because they, as a rule, show neither the marked redness nor acuminated shape usually associated with furuncles. Frequently the skin which covers the inflamed area differs in no way from that of the surrounding parts, while the swelling itself has a somewhat flattened surface. The swellings are, however, usually readily diagnosed as inflammatory by the marked pain occasioned by touching them with a probe. Occasionally, in chronic suppuration of the middle ear, burrowing of pus beneath the posterior wall of the meatus occurs, but the history of the case will serve to distinguish this affection; besides, the swelling then produced usually extends into the osseous portion of the canal, while boils are generally confined to the cartilaginous part of the meatus. Furuncles of the ear, whether left to themselves or opened with a knife, usually result in the evacuation of a small quantity of pus and a core or central slough. It is noteworthy that pointing does not always take place at the spot which represents the most prominent portion of the swelling, and that not unfrequently evacuation occurs at a point concealed from view.

Occasionally modifications of circumscribed inflammation are met with. Thus, under the clinical picture of furunculosis, a considerable swelling may be formed, projecting into the lumen of the canal, usually from the anterior wall. When this is incised, a large quantity of pus (*i.e.*, perhaps ʒss.) is discharged without any central core.

As has been already mentioned, boils are commonly confined to the cartilaginous part of the meatus; but occasionally the osseous canal is the seat of small pustules which give rise to very severe suffering, situated as they are in a region rich in nerves, and where there is little, if any, loose tissue.

After furuncles or abscesses have been evacuated, the orifice through which the pus is discharged may remain open and become surrounded by granulation tissue — a condition of matters probably depending in most cases upon insufficient drainage.

The *treatment* is generally very simple; the furuncle or furuncles should, as early as possible, be incised by transfixing them at the base, and making the blade cut its way into the meatus. For this purpose, a tenotomy knife may be used, or preferably, a small curved and pointed bistoury with a cutting edge of only about half an inch in length. Such an incision, if sufficiently deep, will for the time cut short the pain, and, indeed, effect a complete cure as regards the particular boil operated upon. If the affection be diagnosed at quite an early period, an attempt may be made to abort the incipient boil. Carbolic solution (1–10, or even 1–5) may be employed as a local application, or solid nitrate of silver may be tried as first suggested by Wilde, and again recommended by Schwartze.

If the patient should refuse to allow an incision, some method of relieving pain must be found. Occasionally leeches applied in front of the tragus are useful; while a small poultice may be introduced into the meatus. Large poultices are, however, as objectionable in this as in all other forms of ear disease. Hot water, medicated with some antiseptic, such as boracic acid or corrosive sublimate (1–3000), may be poured into the ear and allowed to remain there for some minutes; this often temporarily relieves the pain, and has the additional advantage derived from the antiseptic. Menthol has been recommended by Cholewa to be employed in oleaginous solution and applied on lint plugs; other observers are, however, singularly unanimous as to the futility of this method of treatment. The application of anodyne liniments and ointments in the neighbourhood of the ear is also recommended by German authorities, and Urbantschitsch states that the constant current has an anodyne action in these cases. Probably the best treatment, short of incision, as a palliative of pain is the introduction into the meatus of one of Gruber's gelatine bougies, medicated with extract of opium. There can be no doubt as to the efficacy of this treatment. These bougies are, when fresh, slowly liquefied by the body temperature, and thus, when one of them is inserted into the meatus, a double action occurs; heat is abstracted, while the extract of opium at the same time acts as an anodyne. The chief objection to the employment of opium bougies is the fact that they harden after being kept for a certain time, and then no longer liquefy at the body temperature.

In order to prevent, if possible, the occurrence of other furuncles, it is desirable to apply some antiseptic to the walls of the meatus. This may be accomplished by the instillation of rectified spirit containing either boracic acid or corrosive sublimate in solution. A more convenient method is to paint the walls of the canal frequently with a solution of carbolic acid in glycerine (10 per cent.), or to insert a plug of lint saturated with this liquid. If cocain be added to the carbolic glycerine, a considerable anodyne effect may thus be produced. After the abscess has been opened, it is of great importance to continue such antiseptic applications to prevent the micro-organisms from entering other follicles; at this period, too, it is desirable to syringe the ear with boracic or corrosive solution. In obstinate cases, where furuncles tend to recur again and again, Schwartze has found great benefit from the instillation of sulphide of potassium (1 per cent. in water). Should granulations form around the orifice through which the boil has discharged, these should be removed either by caustics, or if large enough, with a snare.

In cases of furunculosis it is always most desirable to remedy any unhealthy condition of the system on general medical principles. Failing definite indications, Fowler's solution of arsenic should be administered as recommended by Von Tröltsch. Other remedies stated to have a definite action in arresting the formation of boils are sulphide of calcium ($\frac{1}{10}$-1 gr.) yeast (in tablespoonful doses), and quinine.

DIFFUSE INFLAMMATION OF THE MEATUS.

In most works on aural surgery diffuse inflammation of the meatus is described at considerable length, as if it were an idiopathic affection similar to the circumscribed variety. My own opinion is that this form of inflammation is commonly—if not always—due to some direct and traceable cause.

The older aurists, such as Toynbee and Wilde, describe various stages and forms of otitis externa diffusa, but we must bear in mind that their methods of examination were far inferior to those now at command. I cannot help thinking that such older writers have been somewhat servilely followed by many modern authors. Schwartze and Politzer are, however, noteworthy exceptions, and both agree that idiopathic inflammation of the meatus is extremely rare.

I believe that the most common cause of diffuse otitis externa is inflammation of the middle ear, associated with a discharge through a perforated membrane. Next in frequency must be placed mechanical, chemical, or thermal irritants. Hessler has called attention to the fact that direct infection with septic matter may give rise to a form of inflammation associated with rigors and marked involvement of the lymphatics both behind and in front of the auricle—*otitis externa ex infectione.* Occasionally the presence of a fungus (otomycosis) is associated with acute inflammatory phenomena. Croupous deposits may occur in the external meatus, and according to Bezold they are only found in the osseous portion of the canal. Diphtheria too, may attack the external ear, and then gives rise to otitis externa, characterised by pain even more severe than is usually present in this disease, in addition to the development of diphtheritic deposits. Erysipelas may spread into the auditory passages, and produce various degrees of inflammation, while a very obstinate form of otitis externa, kept up by the presence of condylomata, is occasionally met with in syphilitic subjects. It is obvious that all these various etiological factors are unlikely to produce symptoms sufficiently similar to enable us to evolve a clinical picture of the disease adapted to cover all forms.

Pain is a characteristic phenomenon, and it is severe exactly in proportion as the osseous portion of the meatus is involved in the inflammatory process. In this region the skin and periosteum are so intimately associated that every dermatitis becomes in effect a periostitis. The pain in the diffuse, as in the circumscribed form of inflammation is increased by movements of the jaw and auricle. The temperature is usually raised, and fever is said to be a marked feature in diphtheritic cases. Inasmuch as the inflammation is diffuse it tends to attack the dermoid surface of the drum-membrane; and perforation of this structure may ensue. Deafness is, therefore, more commonly present than in the circumscribed variety, while tinnitus may be a prominent symptom. On inspecting the meatus the walls are seen to be reddened and swollen, while, of course, in the croupous and diphtheritic forms the characteristic deposits may be visible. It is generally stated by authors that a considerable amount of discharge is often met with in otitis externa diffusa. When this is the case I am strongly inclined to suspect that the origin of the fluid is most frequently the tympanic cavity. A dermoid surface such as that which forms the lining membrane of the meatus does not, as a rule, throw off any quantity of secretion from its free surface. The drum membrane is usually concealed by the inflammatory swelling, but when exposed to view it is seen to participate in the inflammation, and as has been before mentioned, perforation, with consecutive otitis media, may ensue. According to Schwartze inflammation of the lining membrane of the osseous canal may lead to necrosis, followed by cerebral complications without any involvement of the middle ear.

In certain cases (*described as otitis externa hæmorrhagica*), the chief feature of the inflammatory reaction is the appearance of extravasations of blood upon the walls of the meatus, and even upon the membrana tympani.

The *prognosis* must depend, to a great extent, upon the etiology. Thus, when the inflammation is due to erysipelas and diphtheria, there is more danger to the middle ear structures than in cases which are purely traumatic. Otitis externa occurring in the course of middle ear suppuration is mainly of importance, because the swelling of the meatus may cause an obstruction to the exit of pus. In all forms of otitis externa, more or less chronic dermatitis may remain after cessation of the acute symptoms. Sometimes granulations are said to occur near and on the tympanic membrane, but when they are present the possible existence of a chronic suppuration of the middle ear, with a very small perforation, should be borne in mind.

The *treatment* of simple diffuse inflammation resembles in many respects that recommended for the circumscribed variety. As a palliative and occasionally curative measure, leeching in front of the tragus is often useful. Anodyne instillations, *e.g.*, acetate of morphia (1 gr. ad. ʒii., of which a few drops are employed), or a solution of carbolic acid and cocain (āā gr. 10 to glycerine ʒii.) may be employed. Very hot antiseptic solutions may also be of use, while in traumatic cases, cold applications around the ear are frequently serviceable. Indeed, after the occurrence of any accident which may lead to inflammation, such cold applications are useful with a view to prophylaxis. If all these methods fail to give relief, longitudinal incisions into the walls of the meatus are most likely to prove rapidly efficacious.

In making such incisions, it is well to choose those points for attack which, when touched with a probe, are most sensitive. After the acute stage has passed, the ear should be syringed with boracic lotion so long as the products of inflammation tend to accumulate. If there be any quantity of discharge, this may be checked by instillations of acetate of lead (gr. 5 ad. ʒi.) or rectified spirit; and should granulations appear, the latter is especially valuable. In obstinate cases, a strong solution of nitrate of silver may be applied to the secreting surface, and granulations may be touched with a bead of the same salt or of chromic acid.

In diphtheritic cases, instillations of lime water, followed by antiseptic irrigation, are to be recommended. In order to prevent the recurrence of false membrane, carbolic glycerine (1–10) or salicylic acid, dissolved in rectified spirit, may be used. The presence of condylomata indicates anti-syphilitic remedies, cleanliness, and the insufflation of iodol, boracic acid, or iodoform.

ECZEMA OF THE MEATUS.

Eczema may attack the meatus primarily, or it may be associated with eczema of the auricle and adjacent parts.

So far as I have been able to observe, the affection is commonly limited to the external portion of the canal. Occasionally, however, the drum membrane is seen to be red, thickened, and scaly, but even in these cases the osseous portion of the meatus seems frequently to escape. Eczema of the meatus has usually the appearance characteristic of what is known as the dry scaly form. Occasionally cracks and fissures form near the external orifice, while the meatus tends to be plugged by masses of epithelium, which soon undergo decomposition, and produce fœtor.

Deafness is not, as a rule, a marked feature of the disease, excepting in so far as it is due to the mechanical effects of the eczematous products; when they accumulate in sufficient quantity, both impairment of hearing and tinnitus may result. I have never seen—nor do I think that it has been observed by others — any serious involvement of the tympanic structures due to eczema; and although, as has been mentioned, the membrana tympani may be thickened in its epithelial layer, this rarely gives rise to marked interference with the auditory function.

The causes of eczema of the meatus are involved in the same obscurity as the subject generally. In primary cases, it has seemed to me, that the gouty habit exercises a predisposing influence. It is not uncommon to find the meatus in an eczematous condition in cases of chronic middle ear suppuration, where these parts are constantly bathed in putrid pus, and there is then no mystery as to the etiology of the skin affection.

To any one fairly conversant with ear disease, the *diagnosis* is, in most instances, simple. As we shall see in a later section, the presence of fungus may keep up irritation in the external auditory canal, and in doubtful cases it is well to examine the masses which are removed from the meatus by means of the microscope. In simple eczema epithelial cells and bacteria only are found, while the characteristic mycelium is absent. Cases of chronic suppuration of the middle ear are sometimes erroneously diagnosed as eczema, but such a mistake is unlikely to be made by a practitioner conversant with modern methods.

The *treatment* of eczema of the meatus must be conducted upon general principles, modified to suit the anatomical position. Thus if the skin disease be secondary to chronic suppuration of the middle ear, it will often disappear whenever a reasonable amount of attention has been given to the primary affection. In other cases attention must be paid to the general health, any gouty taint must be combated, while in all cases arsenic should be administered. I am aware that modern dermatologists rather reject this remedy, but it has seemed to me valuable.

As to *local treatment,* the first essential is cleanliness. The ear must be carefully syringed out with boracic lotion, then dried with absorbent cotton wool, and in many cases this treatment alone will almost suffice. It is, however, usually desirable to apply some further remedy. Ointments are, according to my experience, objectionable, because they tend to accumulate in the meatus, and there to mingle with the products of the eczema. The best treatment is undoubtedly the application of a solution of nitrate of silver in spirits of nitrous ether (gr. 10-15 ad. ℥i.) This solution is employed by the surgeon (or, according to his direction, by an intelligent relative, if the disease be confined to the outer portion of the canal) by means of cotton wool wrapped round a probe and saturated with the medicament. If, immediately after the application the part be covered, the subsequent staining is diminished. The caustic rarely requires to be employed more than a few times, at intervals of from 5-10 days. If an ointment be employed it should be applied in small quantities directly to the diseased area. Oxide of zinc, ammoniated mercury, lead (diachylon ointment of Hebra), or tannin (ʒi. to ℥i.) may be used according to indications. If a tarry preparation be desired I should think the spirits of resin, employed by Sir Douglas Maclagan in the treatment of psoriasis would be efficient. For my own part I have yet to find the case which resists nitrate of silver.

Although the cure of eczema is comparatively simple, it is extremely difficult to eradicate the tendency to recurrence, and it is always desirable that this should be explained to the patient. Repeated attacks then are the rule, and from them considerable narrowing of the meatus may result.

In a case seen by me in consultation with Dr. James Ritchie, actual closure of the meatus by a thick diaphragm, situated near the drum membrane, occurred in both ears, as a result of comparatively slight eczema.

As rare forms of skin disease occurring in the meatus may be mentioned *pityriasis versicolor* and *psoriasis.*

OTOMYCOSIS.

Under this heading otologists class affections of the ear in which masses of fungus are found. To Schwartze is due the credit of having, twenty-five years ago, directed the attention of the profession to the occurrence of fungi in the auditory passages, while soon afterwards Wreden published records of six cases describing the affection as *myringo-mycosis aspergillina.* The most common form of vegetable growth met with is some variety of aspergillus, but various kinds of mucor, ascophora elegans, euroticum repens, tricothecum roseum, euroticum malignum (so called because, when inoculated upon rabbits, these animals died with symptoms of kidney disease), and otomyces purpureus (named from its dark red colour) have been met with.

The causes which lead to the invasion of the ear by these various fungi are not definitely certain. It is extremely probable that some eczematous or inflammatory condition of the meatus in most cases precedes the entrance, or at all events, the growth of the fungus. It was at one time assumed that persons living in unhealthy, damp dwellings —indeed, in places favourable to the development of mould— were most liable to suffer. This has, however, been controverted by the experience of Burnett, Lucæ, and Urbantschitsch. The introduction of fatty matters into the ear has also been accused of being a fruitful source of otomycosis. Children are stated to enjoy immunity from this affection; at least I am not aware that instances to the contrary are on record. Locality must have a very marked influence upon the prevalence of this affection. In Edinburgh, for example, it is extremely uncommon, only a few instances having come under my observation during twelve years.

The *symptoms* of otomycosis vary according as the inflammation is present or absent.

Thus the patient may complain only of blocking of the ear, with impairment of hearing, and tinnitus. Itching, pain, and slight serous discharge may, however, also be present.

On looking into the ear the appearances vary according to the form of fungus present. Sometimes the meatus seems to be filled with a mass of substance, resembling in appearance wet newspaper. Again, not uncommonly, the canal contains desquamated epithelium dotted over with black or yellow points. Only rarely (in the case of otomyces purpureus) is the adventitious matter of a red colour. Although those who have seen a number of cases are enabled to suspect the presence of fungus, yet there are no appearances which can be considered as definitely characteristic. Any doubt is, however, readily solved by examining portions of the tissue with the microscope, preferably after teasing it out in a solution of caustic potash. The mycelium is then seen in quantities, while the spores are fairly abundant, and a fruit-bearing stalk may appear here and there in the field.

It is characteristic of otomycosis that the mass of fungus when removed tends to reappear rapidly—sometimes even within twenty-four hours—unless some remedy be employed to destroy its growth.

Probably the most satisfactory *treatment* is thorough removal of the offending substance, followed by the instillation of rectified spirit. As a rule, this repeated twice a day at first, and afterwards at longer intervals, will effect a cure. Some authors recommend the addition of corrosive sublimate (1 to 500–1000), salicylic acid (2 per cent.), or boracic acid (5 per cent.), to the rectified spirit, while other drugs have been also recommended, such as carbolic acid and hypochlorate of lime.

CHAPTER V.

DISEASES OF THE EXTERNAL EAR.—(*Continued.*)

IMPACTED WAX.

As the reader is probably aware, the cerumen or ear wax is a substance secreted by the ceruminous glands, which resemble sweat glands in their structure. In this secretion, as usually seen, there are also present to a small extent the products of the sebaceous follicles and epithelium. The secreting structures are situated chiefly in the skin of the external or cartilaginous portion of the meatus, and the function of the wax is, in all probability, to entangle dust and other extraneous matter; the whole is then thrown off by the motion of the jaws, aided by the shape of the canal.

The causes which predispose certain individuals to frequent and annoying attacks of deafness, due to accumulation of wax, are not always clear. We are aware that inflammatory affections of the ear are often followed by an increased secretion of this substance. Even a small quantity of cerumen may cause deafness in an ear when the meatus is abnormally narrowed from any of the causes which will be afterwards discussed, while the contraction of the canal may favour the tendency to an accumulation in the same class of cases. As the wax is chiefly secreted in the outer portion of the auditory canal, and, as at the junction of the cartilaginous and osseous divisions of the meatus there is a distinct constriction in the lumen of the tube, an accumulation of wax beyond this narrow point is distinctly favoured by the introduction of small sponges or corners of towels into the ear. The effect of such manipulations is usually only to ram the secreted cerumen beyond the constriction. Foreign bodies, if allowed to remain in the ear for any length of time, tend to become surrounded by wax. It has been stated by some authorities that those who perspire freely about the head are more liable to accumulations of wax, and it has seemed to me that experience rather tends to corroborate this view.

Even a large plug of cerumen may remain in the ear for a long time without giving rise to any discomfort. In these cases, the hearing is often perfect so long as a chink exists through which sound waves may reach the tympanic membrane.

Symptoms—the most important of which are deafness, tinnitus, and a feeling of tension in the head, sometimes amounting to actual vertigo—may, however, come on at any moment when, owing to such mechanical causes as picking the ear, the entrance of water, or even concussion due to a fall or jolting vehicle, the chink becomes filled up. Deafness and other symptoms are, therefore, commonly sudden in their advent when the cerumen is the only cause.

Pain is not a frequent phenomenon, but I have often met with it. When this symptom is present, it is usually found that the plug is composed to a large extent of desquamated epithelium, and that after syringing the ear, the walls of the canal are red and sometimes eroded. Ear cough may also be occasioned, owing to irritation of the auricular branch of the vagus, but it is not common. As very rare symptoms, which have been attributed to the presence of impacted wax, may be mentioned sneezing, facial paralysis, blepharospasm, mental disturbances, and insensibility with spasmodic twitching. I have, however, never met with any of them.

It is worthy of note that very great discomfort may be caused by the presence of a small piece of wax resting on the drum membrane; giddiness and tinnitus may then be troublesome, while the hearing remains good.

The *prognosis* should be guarded, because, although wax may be present, yet some other ear lesion may co-exist, and, indeed, often does. When the deafness and tinnitus have come on quite suddenly, and when the tuning fork is heard better by bone conduction than through the air, great probability exists that the hearing will be completely restored after removal of the obstructing mass. Some years ago I met with an interesting and instructive case. An elderly woman, markedly dull of hearing, complained of deafness in what had previously been her good ear, and on examination a mass of wax was found. When this was removed the membrane was ascertained to be perforated, and the hearing became even worse than before. The explanation was evidently that the cerumen had acted as an artificial drum, but I did not succeed in improving the hearing by the introduction of any of the forms of this apparatus in use; indeed the patient was undoubtedly worse, owing to the well-intended removal of the plug of wax. Kiesselbach has recorded a somewhat similar observation, but, so far as I am aware, a like mischance has not happened to others.

The *diagnosis* of wax is in most cases simple for the practitioner who has had any practice in the use of the speculum. If the wax be soft a brown, sticky mass is seen, while, if the cerumen be hard, it usually has a greyish-black or black appearance. In cases of extreme narrowing of the meatus, however, it often requires considerable dexterity to see the obstructing substance which lies beyond the constriction. Occasionally a film of wax lies over the drum membrane, so as to resemble that structure itself. As has been already stated, a plug of wax often contains a considerable amount of epithelium, and sometimes the whole mass consists of desquamated epithelium merely coloured by cerumen, and containing cholestearin crystals. This condition is variously spoken of as *cholesteatoma* and *Keratosis obturans*, and is due to a desquamating condition of the meatus. It is, however, not to be confounded with the cholesteatoma which results from similar accumulations within the drum cavity as a result of chronic suppuration. In the absence of any definite history of chronic discharge, differentiation between these two conditions is by no means easy. The introduction of a probe, around the extremity of which cotton wool is wrapped, to guard against doing injury, will, however, usually enable a correct opinion to be formed. If the mass be due to an accumulation of the products of middle ear inflammation, the odour of the cotton wool which has been in contact with it will be extremely fœtid, while intense fœtor is rarely present when the mixture of wax and epithelium originates entirely in the external meatus.

The *treatment* of impacted wax is usually simple. The ear is syringed immediately with warm boracic lotion, and, if the accumulation be soft, a few injections will commonly bring it away. If, on the other hand, the mass be hard, or consists chiefly of epithelium, it will be necessary to soften it by repeated warm instillations of bicarbonate of soda solution (sodii bicarb. gr. 10, aq., glycerin., āā ℥ss; twenty drops to be instilled into the meatus several times before syringing is repeated). It is of the utmost importance in such cases that syringing should not be continued after it has become painful. When the accumulation consists largely of epithelium, the loose masses of epidermis may be extracted with forceps. When it is necessary to send the patient away with directions to use the instillation above recommended, it is desirable at the same time to explain that the symptoms may be temporarily increased by this proceeding, owing to swelling of the plug, as a result of the applied moisture. After the meatus has been cleared the hearing improves at once, but it is often not quite normal for some hours. This is probably due partly to concussion of the membrane caused by syringing, and partly to the congestion of that structure, which usually follows even careful manipulation.

While the ear is being syringed it should be inspected from time to time in order to avoid repeating the injection after all the accumulation has been removed. When this has been accomplished, a small cone of absorbent wool is introduced in order to dry up all moisture, and the ear plugged with the same substance for the remainder of the day, with a view to preventing the effects of cold or other irritants.

FOREIGN BODIES IN THE EAR.

It is usual to divide foreign bodies in the ear into *animate* and *inanimate*. It sometimes happens to persons whose occupations or pursuits keep them much in the open air, or who inhabit places infested with vermin, that an insect either flies or crawls into the ear. When the intruder comes in contact with the sensitive osseous portion of the meatus, and more especially with the tympanic membrane, most alarming symptoms may result, such as tinnitus, pain, and giddiness. If a syringe be at hand the offender can thus be simply dislodged ; if not, oil, or even water, poured into the ear will either kill the unwelcome guest or render his position untenable.

In those who suffer from fœtid otorrhea—commonly a result of middle ear suppuration—flies, attracted by the evil odour, enter the meatus and deposit their eggs. These develop rapidly into maggots which attach themselves to the drum membrane and walls of the meatus by the hooklets with which each is provided. Great pain is said to be a frequent—although not constant—result, and inspection reveals the presence of small whitish moving bodies of worm-like appearance. Simple syringing is usually quite inoperative in these cases, and it becomes necessary first to kill the maggots by the injection of chloroform vapour, or by the instillation of alcohol or turpentine, as recommended by Koehler, after which they may be removed by syringing, aided if necessary with forceps.

Much more commonly met with than animate foreign bodies are, however, the various extraneous substances which children and weak-minded adults insert into their ears, such as peas, beans, beads, slate pencil, buttons, shells, cotton wool, etc. It would serve no useful purpose to enumerate all the various substances which have been encountered by the present and past generations of aurists. For practical purposes, however, a distinction should be drawn between such bodies as tend to swell by the imbibition of moisture, *e.g.*, peas and beans, and those which are not so affected.

It is of the utmost consequence that every surgeon before undertaking the removal of a foreign body should assure himself of its presence. This statement may seem to one reader ridiculous, and to another a truism; it is, however, warranted by the experience of every specialist. The statements of patients and of their relatives are in many cases perfectly untrustworthy, and the examination of the ear by means of a probe without illumination, such as is practised by, I trust, an ever decreasing number of surgeons, is both unreliable and prone to inflict grave injury. It is, therefore, the first duty of the practitioner to assure himself of the presence of a foreign body by the sense of sight, and he must be guided by circumstances as to whether it is desirable to introduce a probe to form an opinion as to its consistence.

As a general rule it is advisable to avoid the last-mentioned proceeding, and to resort at once to the syringe in order to dislodge the foreign body without running the risk of impacting it. In many cases the patient is, unfortunately, only examined efficiently after various abortive attempts at removal have been made by the relatives, and occasionally, I regret to write, by medical men. Not uncommonly such injudicious interference has already set up acute inflammatory swelling of the meatus, which may either render illumination of the canal impossible, or lead to impaction of the offending substance. When this has occurred, and provided there be no symptoms indicating urgency, such as high temperature, continuous pain, and head symptoms, the case should be treated by cold applications, leeching in front of the tragus, and gentle syringing with warm boracic lotion until the inflammatory swelling has subsided. If the foreign body be a substance likely to swell up, instillations of alcohol and glycerine will be serviceable, owing to their well-known tendency to abstract water.

The presence of a foreign body in the ear is often looked upon with a fear quite out of proportion to what is warranted by clinical experience. As a general rule, an extraneous substance may be left in the meatus for an indefinite time without occasioning any symptoms beyond deafness, which occurs only after the remaining lumen of the meatus has been filled by wax. It is true that occasionally troublesome cough may result from its presence, and several of the older authors have recorded cases of grave affections of the nervous system relieved by the removal of foreign bodies from the ear, *e.g.*, epilepsy, atrophy of one arm, convulsions, and hemiplegia; but such instances are extremely uncommon. All experienced aurists have removed substances from the ear which have remained *in situ* for years, and which have caused no more serious symptom than deafness, and that only, as before stated, after they had formed the nucleus for an accumulation of wax.

The *treatment* of most cases, which have not been tampered with, requires no armamentarium beyond a powerful syringe. The ear is first inspected, and a mental note made as to the point at which there is most space between the foreign body and the wall of the meatus. The nozzle of the syringe is then directed towards this point, and in most instances the substance is at once dislodged. If, however, repeated attempts result in failure, some other means must be sought. In the case of hard angular substances, I trust chiefly to a small blunt hook, which can usually be insinuated at some point between the walls of the canal and the foreign body, and then hooked over it. For the removal of peas and beans, a sharp hook is required, and the child must be firmly held lest a sudden movement should cause the instrument to tear the walls of the meatus. In the case of rounded bodies, the instillation of oil or glycerine may facilitate their expulsion by means of the syringe. It would serve no good purpose to detail all the various instruments and methods which have been employed; a surgeon of ordinary ingenuity, provided he be able to examine the ear, will in most cases intuitively resort to the most suitable method; it may, however, be mentioned that occasionally the aural polypus snare will be found useful. When the substance is small and heavy, the patient should have the ear syringed while lying with the ear down over the end of a table, so that the force of gravity may aid expulsion. Löwenberg has suggested the application of a paint brush dipped in glue, which is allowed to set, so that the foreign body may be withdrawn with it. Voltolini advised the rapid application of a galvano-caustic point, which is heated only for an instant, as a means of breaking up and facilitating the extraction, more particularly of peas and beans. I have, on one occasion, employed this method with success, in the case of an impacted and swollen pea, but very careful manipulation is required.

If the foreign body has been forced into the tympanum, injections of air and boracic lotion through the Eustachian catheter may be tried, while suction is at the same time applied to the meatus. The ear must also be kept thoroughly clean, by syringing several times daily, as in such cases purulent inflammation of the middle ear almost invariably results. In such cases as I have met with, however, the suppuration set up has seemed to favour the expulsion of the impacted body. As a matter of course, the patients must be closely watched, as any tendency to head symptoms would indicate the removal of the foreign body immediately, by surgical means, at all risks.

The operative procedure then employed is the detachment of the auricle posteriorly, so that direct access is gained to the osseous portion of the meatus, followed, if necessary, by chiselling away the posterior wall of the meatus, as recommended by Gruber. Cases have been recorded where a foreign body, owing to attempts at extraction, has been forced into the mastoid antrum, and become so firmly wedged as to cause great difficulty in extracting it, even on the dissecting table.

I have not said anything so far as to the *prognosis*, for this obviously depends upon the amount of injury done to the auditory apparatus, either by the introduction of the foreign body, or by attempts at its removal. When the tympanic membrane has been injured, the prospects of the patient's complete recovery of hearing power depend upon the same rules which guide us in the prognosis of acute middle ear inflammation generally. Sometimes a fatal result due to meningitis, cerebral abscess, or phlebitis ensues in cases where misdirected efforts at extraction have inflicted serious injury upon the osseous structures.

ATRESIA AND NARROWING OF THE EXTERNAL MEATUS.

Reference has already been made in a previous chapter to the congenital absence of the meatus occasionally met with, associated as it usually is with malformation of the auricle. The reader, too, will remember that in such cases, attempts at operative interference are usually, if not always, contra-indicated.

Sometimes, however, as a result of disease or injury, complete occlusion of the meatus is met with. The most common cause of such atresia is some antecedent suppurative inflammation, which has caused granulations to stretch across the canal; these then become organised, and a complete septum is formed; Politzer has also recorded a case in which closure of the canal was due to the presence of a large polypus, which became adherent to the walls of the canal at its margins. Occasionally we meet with an occluded meatus as a result of injury. In one patient I have seen atresia follow simple and slight eczema. As the case is of great interest, and, I believe, unique, I shall give it in some detail.

About five years ago, Dr. James Ritchie asked me to see with him a middle aged lady who was deaf in one ear. On examination, the meatus was found to be closed near the membrane by a thick and resistant septum—which seemed to be membranous in the centre, and ossified towards the margins. At that time the membrana tympani was freely visible on the other side, and no disease of the meatus could be detected. An operation was performed twice—with knife and electric cautery—but in spite of lead and silver tubes, in spite of laminaria and tupelo wood dilators, no permanent opening could be maintained. About a year ago the same patient was again brought to me by Dr. Ritchie complaining of deafness in the other ear, and to my astonishment I found an exactly similar condition on this side. Anything like suppuration during the interval could be excluded with absolute certainty, but there was a history of slight eczema of the meatus.

The *diagnosis* of atresia is very simple if the septum be situated near the external orifice, and even when it is not far from the drum-membrane the practised eye at once detects that the membrane stretched across the canal is abnormally near, and that its appearance is different from that of the drum-head. If any doubt be felt a probe may be gently introduced until in contact with the septum, after which the distance to which it has penetrated the canal is measured. The average length of the meatus being one inch, the observer can readily determine whether the obstruction in question is too near to be the membrana tympani. The probe is further of considerable value in determining the thickness and consistency of the obstruction.

In estimating the *prognosis* it must be remembered that in a considerable proportion of cases the condition will be found to have been caused by suppurative processes originating in the middle ear, a point as to which the history of the case will afford information. In such instances considerable destructive changes in the middle ear are likely to exist in addition to the atresia, and even if the latter be removed a return of perfect hearing power cannot be expected. At the same time, a patient who can hear at all with a closed meatus will probably hear better when the obstruction has been removed.

The *treatment* must vary according to the nature of the atresia and its situation. If the occluding mass be mainly osseous, it is probably better not to attempt an operation. To this statement, however, one exception must be noticed. As many of these cases are originally due to suppuration of the middle ear, it is possible that this process may recur; obviously under the circumstances drainage is then prevented and head symptoms may threaten. When the history of the case and the symptoms point in this direction, it is of the greatest importance to establish a channel at once. If the obstruction of the meatus be very dense an attempt may be made to procure drainage through the mastoid. When the septum is membranous, thin, and situated near the orifice of the meatus, a crucial incision, followed by the insertion of a tube, may be sufficient. In the case of one of my patients—an intelligent man, living at a distance—finding that there was a tendency to contraction after incision, I supplied him with a conical lead plug, with which he daily dilated the stricture, and achieved a most satisfactory result.

In the case of deep seated thick membranes it is extremely difficult to achieve any result, and the reason is not difficult to understand when it is remembered that in a case dissected by Politzer, the whole osseous meatus down to the tympanic ring was filled by a fibrous plug. If the membrane be not too thick it seems to me that the best line of treatment to attempt is a crucial incision followed by the introduction of an electric cautery point, to enlarge the opening, and burn away the flaps. The tendency to closure must be combated by the introduction of pieces of laminaria or tupelo wood at first, and afterwards by delicate metal tubes. When the membrane is thick and near the tympanum, however, the greatest care is necessary, as the most reckless surgeon may well hesitate to run the risk of inducing middle ear suppuration in a patient whose meatus is occluded.

Simple narrowing of the meatus may occur from various causes. For example, the inferior and anterior walls of the osseous portion may be unduly prominent, and thus cause a proportionate diminution of the lumen of the canal. Again, in old people, the cartilaginous part of the meatus tends to assume a slit-like shape, a peculiarity which was ascribed by Von Tröltsch to senile changes in the cartilage and fibrous tissue, but which is not improbably often associated with the changed position of the ascending ramus of the lower jaw. As a result of inflammatory changes such as eczema, a ring-like constriction may occur in the outer part of the canal. In middle ear suppuration, too, the constant irritation occasioned by the contact of pus tends to produce thickening of the cutis, and in the same disease it is not uncommon to find very marked hyperostosis of the osseous walls—a condition which may increase to such an extent as to occlude the egress of pus, and thus cause head symptoms.

Various forms of tumours may also encroach upon the lumen of the canal.

Narrowing of the meatus is never a direct cause of deafness, unless, indeed, it amounts to complete closure. It tends, however, indirectly to this result, because a very small quantity of wax or epithelium lodging at the seat of stricture may lead to complete occlusion of the narrow cleft through which sound waves have previously entered. If, then, a patient is found to be deaf, and to have at the same time a narrowed auditory canal, the surgeon must endeavour, with the aid of a speculum and strong light, to see past the constriction. If there be any accumulated cerumen or epithelium, this should be softened and syringed out. The history of the case, too, will afford some information, if light cannot be made to penetrate the narrowed channel; for if the deafness has come on suddenly, it is, in all probability, due to some impacted substance. In cases where the cause is eczema, or middle ear suppuration, these affections must be treated.

It is recommended by some authorities that strictures of the meatus should be dilated by means of tubes and tents. As a general rule, I do not think this course is to be recommended, excepting where there is reason to believe that the narrowing is leading to the retention of pus. A drainage tube of lead should then be inserted, if the stricture be membranous. On the other hand, if the obstruction be due to hyperostosis, this must be attacked with a chisel and mallet, or the mastoid antrum may require to be opened.

TUMOURS OF THE MEATUS.

Exostoses are undoubtedly the most common variety of neoplasm met with in the external auditory meatus. The etiology of these tumours is uncertain. It is held by some authorities that frequent sea bathing and diving have a predisposing effect. Others, such as Toynbee and Urban Pritchard, have maintained that gout, or the gouty diathesis, may cause exostoses in the meatus, while Gruber attaches considerable importance to syphilis as an etiological factor. All authors are agreed that distinctly differentiated osseous growths may arise as the result of suppuration of the middle ear: the tumours may, however, then be looked upon as of inflammatory origin, and the distinct tumour-like form is probably accidental; that hyperostosis of a more or less diffuse character may occur under these conditions, we have already seen. The inflammatory form apart, we must, I think, leave the etiology of exostoses an open question. For my own part, I am strongly inclined to look upon multiple exostoses—the most common form—as being connected with gout, because they are so often found in persons of this diathesis, and because they are met with so much more frequently among the better classes—a fact which has already been pointed out by Urban Pritchard. Large single exostoses are rare, and when they are found in a case where there is no history of middle ear suppuration, no satisfactory explanation of their origin can usually be given. Osseous tumours of the meatus are much commoner in men than women, and are rarely pedunculated, being usually attached by a broad base.

In the multiple variety, two or more growths are seen projecting into the lumen of the meatus, leaving between them a more or less narrow cleft. If these projections be touched with a probe, their ivory-like consistence can leave little room for mistakes in *diagnosis.* Their growth is extremely slow, and when several growths are present, there is always a chink left, through which sonorous vibrations may reach the drum membrane. In colour the tumours are of a pale yellowish pink. It is by no means very uncommon to find two small tumours, little bigger than a large pin-head, situated above the membrana flaccida, and corresponding to the free extremities of the tympanic ring, which, it will be remembered, does not form a complete circle.

Large single exostoses, when they occur, commonly grow from the posterior wall of the osseous meatus, and may reach such a size as to entirely occlude its lumen. According to Field they generally arise from the posterior wall of the meatus, and are of slow growth and ivory-like hardness.

Exostoses may exist for a long time without producing any symptoms, and are often detected purely by accident. The small growths occasionally seen at the extremities of the tympanic ring seem never to increase appreciably in size, and all other forms are commonly of very slow growth. When deafness and tinnitus occur these symptoms are usually due to blocking of the channel left between the tumours (in the case of multiple growths), or between the exostosis and the walls of the meatus (in the case of single tumours), by wax or epithelium.

When symptoms are produced by the presence of wax or epithelium, the case should be treated by frequent instillations of soda solution, followed by syringing. It is sometimes a matter of time and difficulty to attain the removal of obstructing particles where the orifice is very narrow. Operative interference may be considered when the tumour completely closes the canal, but it is, in my opinion, only justified when the other ear is deaf, or when there are symptoms pointing to retention of pus. Mathewson employs for these operations instruments worked by means of a dental engine, and Field is a warm exponent and a successful practitioner of this method. The general consensus of opinion seems, however, to be in favour of operating with a chisel and mallet. Schwartze suggests that in difficult cases the auricle may be detached behind, and that in this way the operation can be more easily and safely accomplished. Knapp found that, while the ivory-like hardness of a growth rendered it difficult to penetrate, the tumour could be easily removed by attacking the posterior wall of the meatus from which the exostosis originated. It has also been proposed to destroy the osseous neoplasm by means of the galvano-caustic point, and in certain cases this treatment may prove effective. Pritchard employs diluted nitric acid (½-1 per cent.) in order to soften exostosis, more especially after they have been attacked by a drill.

Pedunculated tumours can be removed with comparative ease, either by means of strong forceps, or instruments on the elevator principle.

Cartilaginous tumours are described by Gruber as occurring both in the osseous and cartilaginous portions of the meatus.

Atheromatous cysts are very rarely found in this situation.

Papillomata or *warts* are occasionally met with.

Angiomata, confined to the meatus, have been encountered once or twice only.

Malignant disease, occurring primarily in this situation, is of rare occurrence. Cases of epithelioma have been recorded by Kessel, Brunner, Lucæ, Delstanche, and Habermann. Gruber states that sarcoma is also met with in children and young persons. The diagnosis of malignant disease must in the early stage depend chiefly upon microscopic examination.

The *treatment* must, of course, depend upon the exact situation and size of the growth. Even where complete removal of the part by incision is impossible, something may be effected by scraping away the diseased portion, or destroying it with the electric cautery, taking care that the destructive action shall penetrate into the healthy tissue.

HÆMORRHAGES.

The occurrence of subcutaneous extravasations of blood is described as *otitis externa hæmorrhagica.* The affection begins with a certain amount of pain and tinnitus; on inspection the lumen of the canal is seen to be encroached upon by one or more bluish fluctuating elevations, which readily burst and exude their sanguineous contents. The prognosis is, according to Politzer, always favourable.

Occasionally bleeding from the ear occurs as a vicarious discharge. Such cases have been recorded by Ferreri, Stepanow, Eitelberg, De Rossi, and Gradenigo. In only one of them was the bleeding point actually observed, in the others small red points were noted, and supposed to indicate the origin of the hæmorrhage. The amount of blood varied from a few drops to a considerable quantity.

INJURIES INVOLVING THE MEATUS.

Occasionally a severe blow or fall upon the lower jaw may drive the condyle backwards in such a manner as to cause fracture of the anterior wall of the osseous meatus. Fracture of the walls may also occur in cases of injuries affecting the head, when the tympanic membrane may also be ruptured. According to Politzer, "fractures of the meatus are rarely confined to this region, but are generally complicated by fissures of the upper or inner tympanic wall, the mastoid process, the petrous portion of the temporal bone, and the base of the skull." With regard to *prognosis,* the same rules apply as in ruptures of the tympanic membrane, and concussions or fractures involving the labyrinth. If only the meatus be involved, no treatment beyond the application of common surgical principles is required.

It is manifest that lesions to any extent may be caused by violence from without, such as attempts to extract foreign bodies, or the introduction of hard instruments; but what has already been stated amply provides for the recognition of such cases.

CHAPTER VI.

THE TYMPANIC MEMBRANE.

It is with some misgiving, and with a consciousness of fostering a classification which is more artificial than natural, and more categorical than clinical, that I have determined to devote a chapter to the drum membrane alone. As a matter of fact, those pathological conditions of the membrane which are of real importance are usually coincident with, and dependent upon, diseases of the external or middle ear. On the other hand, there are certain changes which have been observed in the drum-head which, although of slight clinical importance, imperatively demand mention in a work which has any pretensions to keep up to date. In order to avoid useless repetition, I shall, however, endeavour here only to discuss such points as will not require to be further touched upon in connection with middle ear disease.

Injuries of the drum membrane also form a very important group of cases, but these might have been discussed grouped with traumatic lesions of the ear as a whole. All things considered, however, it has seemed to me that the introduction of this chapter is justifiable.

ACUTE INFLAMMATION (MYRINGITIS ACUTA).

Acute inflammation of the membrane is described as an affection *per se* by most Continental authors. It is said to result from the action of cold air or water, and other irritants, on the external surface of the tympanic membrane. That it may arise as a complication of otitis externa we have already seen.

The *symptoms* of myringitis, as commonly described, are in perfect correspondence with those met with in acute inflammation of the drum cavity, excepting that deafness is said to be slight or absent in the former, while it is marked in the latter. It is further urged that the introduction of the Eustachian catheter, followed by the injection of air, does not give rise to moist sounds as the air passes through the middle ear structures; nor does it produce any change in the hearing which, as we have seen, is only slightly affected in myringitis.

The objective changes, too, are described as exactly analogous to those met with in acute inflammation of the middle ear, which will be afterwards discussed.

I have never myself seen a case of primary inflammation of the tympanic membrane. That is to say, I have not seen a case where the drum-head presented evidences of acute inflammation, and where the hearing was not noticeably impaired. As to the results of catheterism, I cannot judge, because I consider it bad treatment to employ this instrument during the painful stage of an acute middle ear inflammation.

To discuss the *treatment* of myringitis is unnecessary, as the same rules which will be detailed in the chapter on acute middle ear inflammation are applicable.

Bezold has described a form of myringitis in which fibrinous exudation is thrown out upon the drum membrane (*croupous myringitis*).

CHRONIC INFLAMMATION (MYRINGITIS CHRONICA).

While I have often seen a scaly condition of the outer surface of the tympanic membrane in patients who suffered from eczema of the meatus, I cannot say that, apart from such instances, I have met with chronic myringitis.

The *symptoms* ascribed to chronic inflammation of the membrane are otorrhœa and itching, with more or less deafness.

The deeper parts of the meatus are said to contain crusts, while the membrane is covered with pus which, when removed, reveals thickening, congestion, and sometimes polypoid nodules. A form of what may be called polypoid degeneration, associated with the presence of numerous papillary outgrowths, has been described by Nassiloff as *myringitis villosa.* De Rossi has named a variety of inflammation, characterised by a tendency to scaling and accumulation of epidermic *debris* on the outer surface of the membrane, *myringitis sicca.*

The *diagnosis* of this last named condition is simple enough, and, as before said, it may occur in eczema, but that of the other forms appears to me difficult. It is perfectly well known that perforations cannot always be detected, either by the catheter or inspection, and it is for this reason difficult to exclude chronic suppuration of the middle ear.

The *treatment* should consist in removing all *debris,* whether purulent or epithelial. When the surface of the membrane is secreting pus, Politzer recommends the insufflation of finely powdered boracic acid; but in view of the possibility of mistaking this condition for middle ear suppuration with a small perforation, his advice must be acted on with extreme caution (*see* middle ear suppuration). Schwartze advises painting the part with a solution of zinc sulphate or lead acetate; these drugs may also safely be employed as ear drops (5 gr. to ℥i.). In obstinate cases, the same author advises the application of a 50 per cent. solution of chromic acid. Granulations may be touched with a bead of nitrate of silver or chromic acid fused on a probe, or with a drop of solution of iron perchloride, as advised by Politzer.

When there is much desquamation, the epithelial masses should be softened with a solution of soda—as recommended in cases of wax—and syringed out with boracic lotion. Afterwards nitrate of silver (gr. 20-40 ad ℥i.) may be applied with cotton wool twisted round the end of a probe.

CHANGES IN THE MEMBRANE RESULTING FROM PREVIOUS INFLAMMATION.

It will be unnecessary here to refer further to such changes as usually result from diseases of the middle ear, which will be referred to at length in a later chapter. Perhaps, however, it may be excusable at this stage to mention chalky deposits. These calcareous patches, it is true, usually occur in patients who have at some time previously suffered from middle ear suppuration, and therefore they are, as a rule, associated with the presence of cicatrices or open perforations. They may be situated in any part of the membrane, but not unfrequently one of these deposits assumes a horse-shoe shape around its lower part. As just stated, they are usually the result of suppuration, but may exist in persons whose hearing is perfect, and in whom there is no history of past otitis.

NEOPLASMS.

These are of little clinical importance—if we except those cases of middle ear suppuration, in which a polypus springs from the membrane, and which will be referred to in a later chapter. The following pathological conditions coming under this category have been described:—(1) horny growths; (2) cholesteatomatous tumours; (3) vascular tumours; (4) osseous deposits; (5) cysts; (6) gummata; (7) tubercular deposits, appearing as yellow points, and leading to multiple perforations, which tend to coalesce, the whole process running its course without pain (Schwartze).

Ruptures of the Tympanic Membrane.

Traumatic perforations may occur from a variety of causes. Thus, while a person is passing through a thick wood a small twig may penetrate the meatus and injure the tympanic membrane. Many individuals indulge in the introduction of knitting needles, penholders, and the like, into the meatus, either to relieve itching or from force of habit, and an accidental movement of the hand may then lead to a similar result. Occasionally, as we have already seen, the membrane is injured by attempts to remove a real or imaginary foreign body. It has been already stated that fracture of the osseous meatus, associated with rupture of the drum-head, may result from falls or blows on the head, which usually cause fracture of the base of the skull as well. Sudden changes in atmospheric tension are common causes, but inasmuch as the experiments of Gruber and Schmiedekam have shown that a considerable pressure is necessary to rupture a healthy membrane, such cases usually occur in individuals whose drum-heads show evidence of previous disease, *e.g.*, chalky deposits, atrophic patches, and cicatrices. It must also be borne in mind that the effects of sudden condensation of the air column on the outer surface of the membrane will be considerably enhanced if there should exist at the same time diminished pressure within, as is the case when the Eustachian tube is obstructed. The most common cause of this kind leading to perforation is boxing the ears with the open hand. Loud sounds, explosions, diving, and similar causes, may also bring about a rupture from increased pressure of the external air column. In the case of much atrophied, chalky, or cicatrised membranes, the air douche employed with every precaution, and even blowing the nose, may cause a perforation. Suction applied to the meatus, whether by design for therapeutic purposes or accidentally, as in a case recorded by Von Tröltsch, where a kiss caused rupture of the membrane, may have a similar effect.

I have also seen a case where a very extensive destruction of the membrane resulted from the introduction of boiling liquid.

The appearance of the perforation varies according to the cause. Thus, if the injury be occasioned by a solid body, the size and shape of the wound must differ according to the instrument which inflicted it, and the violence employed. In perforations resulting from explosions the orifice often resembles that about to be described as resulting from blows with the hand, but I have in one such case seen a large portion of the membrane loosened and turned over, so as to expose the tympanic cavity to view. When the force which causes the compression of air is moderate the rent is commonly situated either just behind or in front of the lower extremity of the manubrium. The orifice tends to assume a lozenge shape, with the extremities pointed, while the long axis extends from the centre to the periphery. This shape is explained by the fact that the rupture seems always to occur parallel to the radiating fibres which form the outer layer of the connective tissue known as the substantia propria. The circular fibres are, however, also torn, and the tension exercised by them causes gaping of the wound. In all cases there is a certain amount of hæmorrhage, but as ruptures are commonly met with in atrophied membranes, the bleeding is usually slight.

At the moment when the injury is inflicted, the patient hears a crack in the ear, and is often extremely giddy for some time afterwards. Not unfrequently this is associated with tinnitus, while the hearing becomes more or less impaired if the ear has been hitherto healthy. Under certain circumstances, however, audition may be distinctly improved after a perforation has occurred; thus, if there be free fluid or adhesions in the middle ear, this apparent anomaly may result. There is no doubt that a simple perforation is by no means inconsistent with very good hearing power.

This leads us naturally to a consideration of the *prognosis*. There is, almost invariably, associated with the rupture more or less concussion of the tympanic structures, and often of the auditory nerve. If the former predominate, the tuning-fork will be heard better by bone conduction in the affected than in the normal ear; whereas, if concussion of the labyrinth is present to a marked degree, the converse will occur. If, then, there be very marked deafness, it will be necessary to give a guarded prognosis pointing out that in all probability some improvement will occur—for this is the rule.

Provided the deafness be not marked, and the case is seen at once, a favourable result is to be anticipated; although, in unhealthy subjects, and even in healthy persons who have been wrongly treated, acute middle ear inflammation may ensue. Injuries of the membrane, due to burns, are, so far as I have seen, always followed by middle ear inflammation.

A considerable number of cases have been recorded in which, in addition to rupture of the membrane, fracture of the manubrium mallei has occurred. The presence of this lesion does not, however, materially influence either the prognosis or treatment.

The *diagnosis* of perforations is easy, for the orifice can usually be seen; while Valsalva's experiment, or the air douche, is followed by the whistling of air through the aperture.

The *treatment* is very simple. On no account should the ear be syringed or in any way interfered with, as the tympanic cavity is particularly intolerant of liquids, and their introduction is almost certain to be followed by inflammation. The meatus should be plugged with cotton wool, while rest, low diet, and abstinence from alcohol and tobacco, with avoidance of exposure and cold are enjoined. Under this negative line of therapeutics, the perforation usually heals with great rapidity. Should pain occur, cold compresses must be placed over the ear, the meatus being at the same time plugged, while a couple of leeches are applied in front of the tragus. Only in the event of suppuration setting in should recourse be had to injections; the case, indeed, must, in the event of this complication supervening, be treated as one of middle ear inflammation.

CHAPTER VII.

ACUTE INFLAMMATION OF THE MIDDLE EAR.

It is usual to subdivide acute inflammation of the middle ear into *acute catarrh* and *acute suppuration*. This classification is perhaps justified on clinical grounds, and yet it must be admitted by every specialist that it is often quite impossible to say when, in a case of acute catarrh, the secretion has become purulent. In other words, it passes the wit of man to distinguish a severe case of acute catarrh from a mild case of acute suppuration.

A more scientific and, at the same time, an equally satisfactory classification, is a division of acute middle ear inflammation into (1) a mild, (2) a severe form; to which must be added a consideration of certain special forms.

Let us first glance briefly at inflammation of the middle ear generally, before discussing the special features of each variety. The mucosa lining the tympanum becomes intensely inflamed, and a more or less copious exudation soon follows the inflammatory swelling. The tympanic membrane as a whole, and even the deeper parts of the meatus, participate in the inflammatory process, while the deafness which forms a marked feature of the affection is due partly to clogging of the ossicles by swelling of their investing membrane and the exudation which surrounds them, and partly to changes in the tympanic membrane and in the membranous covering of the fenestra rotunda. In mild cases the exudation is composed chiefly of more or less tenacious mucous, but in the more severe forms it is distinctly purulent. In children it is not uncommon to find that the inflammatory products consist almost entirely of fluid serum. In both children and adults the effused fluid may consist largely of blood (hæmorrhagic otitis media). Many observers have of late years been occupied in investigating the bacteriology of otitis media.

Löwenberg seems to have first demonstrated the presence of the staphylococcus pyogenes aureus in the inflammatory exudation of acute middle ear inflammation; and Kessel, Dunin, Fränkel, and Simmonds have confirmed his observations. In 1887 a most interesting and elaborate paper appeared from the pen of Netter, in which he proposed to classify cases of otitis media according to the form of organism met with in the secretion. To quote his words, "We now know four varieties of acute otitis media.

"Otitis due to the streptococcus pyogenes (Netter, Zaufal, Moos, Holst, Dunin).

"Otitis due to Fränkel's pneumococcus (Netter, Zaufal, Leyden ? Senger ?).

"Otitis caused by the pneumobacillus of Friedländer (Zaufal).

"Otitis set up by the staphylococcus pyogenes (Fränkel, Simmonds, Dunin, Rohrer, Netter)."

This author desires to found not only a pathological but a clinical classification upon these data; it appears to me, however, that the time is not ripe for the successful issue of such an attempt. Zaufal also has for years investigated the organisms which lead to middle ear inflammation, and seems to have arrived at the conclusion that the pneumococcus (Fränkel, Weichselbaum), the streptococcus pyogenes, the staphylococcus pyogenes (albus and aureus) and the bacillus of Friedländer have been proved to be causes of otitis media. In the case of other organisms which have been discovered in the secretion (*e.g.*, staphylococcus cereus albus, staphylococcus tenuis, bacillus tenuis, micrococcus tetragenus, bacillus pyocyaneus and spores of oidium albicans), he considers it doubtful whether they are the actual causes of the otitis, while he admits that they occur in both primary and secondary inflammations. Zaufal further states that he does not believe that the Eustachian tube is impervious to organisms; on the contrary, he considers it the common channel through which infection of the tympanum occurs. In ten cases which Gradenigo investigated he found Fränkel's pneumococcus alone six times, the same organism associated with staphylococcus aureus et albus once, staphylococcus aureus et albus alone, once, and staphylococcus pyogenes albus, twice. Levy and Schrader have investigated the secretion in fourteen cases, but have arrived at the conclusion that, from a clinical point of view, bacteriological examination is of little importance.

In tubercular subjects the middle ear in all its parts may be the seat of the changes characteristic of this disease as pointed out by Habermann. Previously Voltolini had shown that the tubercle bacillus is met with in the aural discharge of consumptives who suffer from otorrhœa due to localisation of the disease in the middle ear.

In diphtheria and in so-called scarlatinal diphtheria, otitis media may be associated with the presence of false membrane in the middle ear, as first pointed out by Burckhardt-Merian, but it must be remembered that by no means every otitis media occurring in connection with these affections is due to the presence of diphtheritic exudation.

In young infants acute inflammation of the middle ear is comparatively common, and its frequency is probably connected with the increased activity of the absorbents—an activity which is necessary to bring about the absorption of the mucoid mass which fills the tympanum at birth. As direct causes of middle ear inflammation may be cited catarrh of the nose or throat, measles, scarlatina, smallpox, pneumonia, bronchitis, typhoid fever, phthisis, and septicæmia. Surf bathing, too, is a common factor according to the experience of American authors. Occasionally the careless employment of the nasal douche leads to the solution employed entering the tympanic cavity, and inflammation may be thus set up as pointed out by Roosa. The same authority considers that cerebro-spinal meningitis is a frequent cause of otitis media. During the recent epidemic of influenza acute inflammation of the tympanum has been a common feature of the disease. In certain chronic diseases which tend to cause hæmorrhages, blood becomes effused into the middle ear, and occasionally by its presence sets up inflammation. This has been observed in Bright's disease by Schwartze and others, while a similar result has been described by Gradenigo in a case of Leukæmia. According to Weber, Liel and Hotz, malaria is a not infrequent cause, while the observations of Luchau seem to show that the same is true of relapsing fever. Diabetes, too, is sometimes associated with obstinate suppurative otitis which is liable to become chronic and ultimately to affect the temporal bone.

The *symptoms* of acute otitis media vary considerably according to the severity of the attack, and, as we shall see later, also according to the exciting cause. Briefly stated the most prominent are pain and deafness, while more or less fever is commonly met with.

The pain varies much in severity. In some cases the patients complain only of a disagreeable sense of fulness, often associated with tinnitus, while in others the suffering is intense. As a rule the pain is referred to the deeper part of the meatus, and is aggravated by pressure on the tragus, or by blowing the nose, coughing, hawking, and indeed by any act which tends to increase tension in the middle ear. The pain may radiate over the head, neck, and teeth. It is usually intermittent or remittent in character, and is generally worst at night.

At first the deafness is not very marked, but it soon becomes so; as one ear only is usually attacked the healthy organ must be excluded while the hearing power of the affected ear is being tested.

The pulse and temperature are, as a rule, both elevated, the latter is commonly under 101° in mild cases, and rarely exceeds 103° in severe attacks.

The parts around the ear are sometimes tender. Thus, the region of the Eustachian tube becomes painful on pressure, and sometimes deglutition alone elicits this symptom. The mastoid process may become involved, when redness, tenderness, and eventually, if the inflammation be not checked, swelling may occur, which in turn may finally result in the formation of an abscess.

Such are the salient features of acute otitis media. In children, vomiting, delirium, and even convulsions, may occur early in the disease, thus causing it to simulate meningitis. In adults delirium is rare, and when it occurs is of serious import.

In young infants the affection is often overlooked. The possibility of its presence should be considered when the child is restless, puts its hands constantly towards the ear, but shrinks and screams when the tragus is pressed upon.

Vertigo occasionally occurs, but this symptom is not necessarily of any grave significance, unless there be other evidence of organic changes in the labyrinth. Sometimes facial paralysis appears during an attack of even comparatively mild otitis media. Some years ago I met with a case in which this was bilateral, and probably due to a congenital defect in the osseous covering of the facial nerve. The patient, a boy, was brought to me, with acute middle ear catarrh in one ear, associated with complete paralysis of the same side of the face. In a day or two I saw him again, and found exactly the same state of matters on the other side, while the facial nerve first involved continued paralysed. Unfortunately I am unable to give the result in this case, as the patient was abruptly taken from hospital.

Having thus discussed the general etiology and semeiology of acute otitis media let us now turn to a consideration of the clinical types met with.

Mild form (*acute middle ear catarrh*).—This affection occurs most commonly in children, but may also be met with in adults.

The patient complains of earache usually towards evening, but eventually gets to sleep. This may be repeated on several nights, while both temperature and pulse are slightly raised, and finally the pillow is found to be wet from discharge, or fluid is detected in the meatus. On enquiry it is usually found that the attack was preceded by a cold in the head. Examination of the drum membrane in these cases shows more or less congestion, and often indrawing of the membrane in its upper part, as shown by the prominence of the short process of the malleus, while at the same time the posterior inferior segment may be distinctly bulged. The congestion is most marked just behind the manubrium of the malleus, where the membrane may show a diffused pink tinge. From the handle to the periphery single radiating vessels may usually be traced, while not unfrequently the membrane shows a greyish opacity due to the presence of mucous exudation behind it.

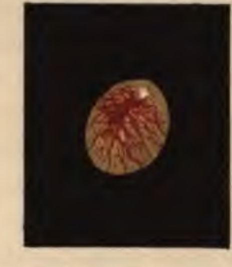

FIG. 25.—Acute middle ear inflammation—mild or catarrhal form.

The pain disappears whenever a perforation has occurred, but rupture of the membrane is by no means an essential feature of the case, for the inflammation may subside and the exudation disappear without either incision or spontaneous opening. The aurist often meets with cases where the history points to a perforation having occurred during the preceding night, with the escape of sufficient serous fluid to leave a mark on the pillow, and yet, when the ear is examined on the following day, no aperture is detectable, but, at the point where the membrane has given way, a little speck of coagulated blood is often found.

It is of great importance in this class of cases not to consider the affection cured when the pain has subsided.

In children who suffer repeatedly from such attacks the *fons et origo* will generally be found in the presence of adenoid vegetations in the naso-pharynx, which should be removed. Moreover, after each attack the hearing will be found to be impaired, and, in order to treat the deafness, recourse must be had for a time to inflation of the middle ear—a method which will be more fully discussed when considering the treatment of acute otitis media as a whole. Careful treatment in these cases usually results in a perfect cure.

Severe Form (*acute suppuration of the middle ear*).—In this form all the symptoms and signs are aggravated. The pain is more intense, and fever is a marked feature.

If the case be seen early the appearance of the tympanic membrane and osseous meatus may be similar to those mentioned in connection with the milder variety; indeed, the latter may pass into the more severe form. As a rule, however, the changes in the drum-membrane are very much more marked, while the participation of the lining membrane of the osseous meatus is more pronounced. The former has, by the time the case has come under observation, usually lost all its characteristics. Thus, the handle of the malleus is no longer seen, and, as the case advances, even the short process becomes invisible; at an early stage the last-mentioned prominence may, however, still be descried as a yellow point. Meanwhile the outer surface of the membrane takes on all the appearances of inflamed skin. As a rule the osseous meatus and the drum-head form a *cul de sac*, to all appearances lined by bright red cutis. On the membrane itself vesicles, and even small abscesses, may form, while in all cases the brilliant red colour usually soon gives place to a sodden appearance, for, as the case advances, scales of macerated epithelium are thrown off. As the process of exudation goes on within the tympanum, more or less pronounced bulging of the drum membrane may arise, and sometimes the tension is so great that a yellow spot is seen at the point corresponding to the position at which—if the case be left to itself—it will eventually give way. If such a case be carefully examined pulsation may occasionally be seen in this situation, even before an actual perforation has occurred; as a rule, however, this phenomenon is not observed until the membrane has become perforated.

When a perforation has occurred the pain usually abates, and, on examination, a considerable quantity of pus or muco-purulent fluid is found in the meatus. The column of liquid, if carefully examined, is seen to have a rhythmic pulsating movement synchronous with the heart beat. Whenever the presence of liquid in the meatus is associated with pulsation of the fluid column a perforation may be suspected to exist. When the secretion has been removed the perforation, being commonly a mere rent, is often not visible. Most commonly it is situated at the anterior and inferior part of the membrane, and in this situation Valsalva's experiment will cause the extrusion of a drop of pus. If the Eustachian tube be blocked, air driven through by one of the other methods already discussed will give rise to the same phenomenon, while, if the ear of the surgeon be connected with that of the patient, the current will be heard to whistle through the orifice, the sound being associated with coarse, bubbling râles.

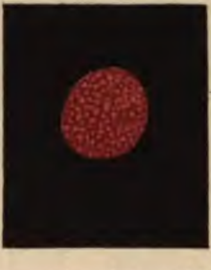

FIG. 26.—Acute inflammation of the middle ear (severe form).

As the case progresses the hearing becomes distinctly worse, and sometimes the deafness is very marked. As a rule, the tuning-fork is well heard by bone conduction, but this is not always the case; sometimes the labyrinth becomes affected by the inflammatory process, and even suppuration of this structure has been known to occur. Fortunately, however, implication of the internal ear is rare. In severe cases the mastoid process may become involved, either early in the disease or after perforation has occurred. The bone behind the ear then becomes tender to the touch, either all over or at certain parts. Thus pressure can sometimes be well tolerated at all points, excepting at the tip or base of the mastoid. As a rule this tenderness is associated with redness of the part and some swelling. Even when none of these changes are very marked the auricle of the affected side will be seen to stand out more prominently from the head than its fellow, and this phenomenon is highly indicative of mastoid inflammation. As a rule when the mastoid becomes involved there is a distinct exacerbation of the general symptoms.

As pointed out by Blake and Sexton the inflammation of the tympanum may be confined to an area described by the latter as the attic of the tympanum. Whether, however, the whole upper area of the drum cavity is involved in these cases, or only the small portion situated between Schrapnell's membrane on the outside and the head of the malleus within (Prussak's space) must remain doubtful. The clinical phenomena are, however, sufficiently well known. The general symptoms are those of otitis media, but on inspection the inflammation and bulging are confined to Schrapnell's membrane. If a puncture be made in this, serum, mucus, or pus escapes; while, if the lower part of the membrane be perforated no secretion appears.

We have seen that with perforation of the membrane, which usually occurs spontaneously, if paracentesis be not performed within a few days from the onset of the pain, this symptom usually abates; the same is true of the febrile condition. The deafness, however, remains for a longer or shorter time, according as the case is properly or improperly treated.

No doubt, in a number even of neglected patients, a fair amount of hearing power eventually returns; while, in very severe cases, the best applied efforts sometimes fail to restore anything approaching normal auditory function. When the perforation first occurs the discharge is usually profuse, but in favourable cases gradually diminishes. At the same time the drum membrane very gradually tends to return to the normal, although for a long time it remains congested and opaque. A certain amount of opacity often remains, and not infrequently a permanently visible cicatrix is left at the seat of the perforation. These cicatrices are at first pink and afterwards assume a dark appearance. Chalky deposits in the membrane are by no means a rare sequel of acute otitis.

As to the duration of the case after perforation has occurred, it is impossible to speak positively. If the patient be robust, the membrane will usually be cicatrised and the hearing comparatively good after a few weeks. On the other hand, the affection may pass into the chronic form and suppuration may persist for years, associated with a varying degree of impaired hearing.

A very troublesome complication is closure of the perforation before the discharge has ceased; this can, however, usually be prevented. Before discussing the prognosis it will be desirable to call attention to certain forms of acute middle ear suppuration which, from their peculiar character, deserve special notice.

Hæmorrhagic Otitis Media.—Inflammation of the middle ear, associated with hæmorrhage, may be primary or secondary.

In the primary variety, which was first brought under notice by Roosa, the causes are the same which may produce the non-hæmorrhagic form, more especially exposure to cold. The course of the disease is frequently extremely rapid, only a few hours often elapsing between the onset of intense pain and rupture of the membrane. When this event occurs, however, more or less pure blood, with perhaps some admixture of serum, is evacuated.

My own impression is that the hæmorrhage takes place, owing to the inflammatory process being cut short during the period of vascular engorgement by rupture of the vessels, due to diminished air pressure within the tympanum consequent upon a previously existing Eustachian obstruction. Hæmorrhagic otitis media occurring in a healthy person usually runs a favourable course, although the sanguineous discharge may gradually give place to pus.

In Bright's disease hæmorrhage into the middle ear may occur, and thus an otitis media is liable to be set up. Schwartze was the first to record such a case, but I am not aware that a sufficient number of examples are on record to warrant definite conclusions as to prognosis.

Otitis Media in Influenza.—During the recent epidemic of influenza[1] a number of observations were made upon the otitis media with which the disease was so often associated. Most authors agree that in this variety the tympanic membrane, if seen before rupture has occurred, is often the seat of hæmorrhagic exudation. Frequently, when the drum-head gives way, the discharge consists largely of blood, as in hæmorrhagic otitis. The most important feature, however, of these cases was, according to my experience, that the pain continued for some time after the perforation had occurred. In a simple acute inflammation of the middle ear, the persistence of pain after evacuation of the contents of the tympanum is a symptom of grave import, indicating insufficient drainage and resulting tension. In influenza, continuance of pain after the occurrence of discharge seemed to be the rule, and yet the majority of cases made good recoveries. This peculiar clinical feature was also observed by Michael and Gruber, among others.

As to the severity of the otitis during the recent epidemic, the experience of authors has differed. Thus Gruber and Politzer in Vienna seem to have met with a larger percentage of mastoid complications than in simple acute inflammation, and Truckenbrod in Hamburg appears also to have encountered severe forms of otitis. On the other hand, Junkau in Strasbourg, Löwenberg in Paris, and Szenes in Buda Pesth, describe a form of otitis which can certainly not be described as more grave than usual. Szenes certainly, out of twenty-eight cases, met with periostitis of the mastoid in five instances, but in every one the inflammation was subdued without recourse to operation. My own experience has been that the otitis media of influenza is more painful than the simple variety, but that its ultimate results are not appreciably worse. Although I only met with a single case in which I required to open the mastoid process, a number of my patients complained of pain behind the ear, which to a careless observer might simulate mastoid inflammation, yet a closer investigation showed that this was not the case. In true mastoid cases, the pain and tenderness are most marked over the process itself, usually at the tip or base, while the pain of influenza otitis is commonly referred to a point behind the mastoid, and corresponding nearly to the point of junction between the temporal and occipital bones. Again, in the middle ear suppuration of influenza, uncomplicated with mastoid inflammation, the auricle does not stand out from the head. As I saw a number of these cases, in which the pain gradually subsided without requiring surgical interference, I have assumed it to be neuralgic in character and not due to inflammation of bone. From what has been stated, the reader will gather that the otitis media of influenza has clinical characteristics quite peculiar to itself. In a few instances, this characteristic otitis associated with fever is the only manifestation of influenza.

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[1] The epidemic of 1889-1890.

The line of *treatment* to be adopted does not materially differ from that about to be described for acute otitis media; but obviously antipyrin, phenacetin, exalgine, or other suitable remedies should be administered, in order to relieve so much of the pain as is due to neuralgia.

Otitis Media in Typhoid.—A slight amount of middle ear catarrh is by no means uncommon during the course of this disease.

According to statistics collected by Bezold, purulent otitis occurred 41 times in 1243 cases. As a rule the disease runs a favourable course in previously healthy persons, but Politzer states that occasionally inflammation of the labyrinth is superadded, and complete deafness may then result. The patient is exposed to the risks common to all forms of severe middle ear inflammation, which will be discussed later.

Otitis Media in Scarlatina and Diphtheria.—In true diphtheria a very severe form of middle ear inflammation may occur, associated with the occurrence of the characteristic exudation within the tympanum.

In scarlatina, especially when associated with the presence of false membrane in the nose and throat, the middle ear is very frequently affected. That a diphtheritic process is of frequent occurrence in the tympanum under these circumstance has been shown by Wreden and by Burckhardt-Merian. It is, however, probable that a number of destructive suppurations occur without the presence of any false membrane; at all events its presence cannot always be demonstrated.

The severe form of otitis media usually occurs during the height of the fever, is associated with pain and increased febrile movement, while, after perforation has taken place, there is a strong tendency for the orifice to increase. Not uncommonly the whole membrane is rapidly swept away, and not unfrequently the ossicles become carious, and are thrown off. The temporal bone, too, may be attacked, and occasionally the suppurative process invades the membranous labyrinth (panotitis), and even portions of its osseous capsule may be exfoliated.

The *prognosis* in this form of otitis is serious; the process tends to become chronic, and at best a large perforation is usually left, while permanent deafness—which is sometimes absolute—not unfrequently results. It goes without saying that the patient is also liable to risks to life from caries, which may lead to intracranial lesions. If an individual during this affection becomes quite deaf, and at the same time giddy, implication of the labyrinth is certain, and recovery of hearing power problematical.

It is doubtful how far energetic *treatment* can stop the disastrous consequences of diphtheritic or scarlatinal otitis. All authors agree that an early incision of the membrane is desirable, and, theoretically, washing out the middle ear with boracic lotion or some other antiseptic, injected through the Eustachian catheter, as advised by Continental authorities, is unexceptionable. It must, however, be remembered that the sufferers are often extremely ill, and that they are commonly children, so the surgeon must be guided by circumstances as to how far it is desirable to carry local treatment. The disease is often bilateral, and then fluids injected into one nostril, while the other is closed, can be made to pass into the Eustachian tubes with comparatively slight discomfort to the patient. The ear must also be repeatedly syringed with antiseptic lotions, and if there be distinct evidence of false membrane the meatus must be filled from time to time with lime water or a digestive solution (*e.g.*, liquor pancreaticus rendered slightly alkaline, or papain solution 5 per cent.). The treatment otherwise must be carried out on the lines which will afterwards be laid down.

According to Voss a comparatively innocent form of otitis media occurs during convalescence from scarlet fever. This author has found it often associated with albuminuria. The affection runs the course of a mild acute otitis media with perforation of the membrane. A serous or sero-purulent discharge follows, and the quantity of this exudation is inversely proportionate to the amount of urine passed. As the albuminuria disappears the discharge ceases.

Otitis Media in Tuberculosis.—Although previously Schwartze had, on clinical grounds, felt entitled to diagnose the presence of tubercular deposits in the tympanic membrane and mucosa, and Schütz had established the common occurrence of middle ear tuberculosis in the pig, while Voltolini had demonstrated the occurrence of tubercle bacilli in phthisical otorrhœa, Habermann deserves the credit of having shown that giant cells and bacilli actually occur in the lining membrane of the middle ear in certain cases of phthisis. Years ago Von Tröltsch described the typical form of suppuration which often runs its course without pain, while rapid destruction of the tympanic membrane takes place owing, according to Schwartze, to the breaking down of small miliary nodules which are visible as grey cheesy deposits. In a case where the disease is suspected to be tubercular the secretion should be examined for bacilli.

The *prognosis* is certainly unfavourable as regards the hearing and the tendency to the invasion of bone, associated with the general dyscrasia, makes tubercular otitis dangerous to life.

The *treatment* must be conducted on general principles. I have never seen a case in which I should have felt justified in operative interference with a view to remove the tubercular tissue. On the other hand, instillations of lactic acid would be worthy of a trial, while possibly Koch's lymph may prove beneficial in some cases. At present, however, it is extremely doubtful whether its employment would be even justifiable. So far as I know only one case has been benefited, and Schwabach's experiments on several patients have yielded most unsatisfactory results.

Otitis Media in Diabetes.—According to Kuhn a very severe form of acute middle ear inflammation, associated with hæmorrhage, profuse suppuration, and a decided tendency to spread to the mastoid process is met with in this disease.

No special treatment is indicated for this form; although, where operative measures would be judicious on general grounds, the surgeon must, in considering the propriety of interference, give due weight to the presence of glycosuria.

Otitis Media in Syphilis.—I have never been able to convince myself of any connection between middle ear suppuration and syphilis, further than would be explained by an increased tendency to all forms of inflammation in a dyscrasic individual. At the same time I have no desire to contend that such a connection may not exist; for many leading authorities hold that it does. The question is, however, not of much practical importance, for, if other manifestations of syphilis, whether acquired or congenital, are present, anti-specific treatment will be indicated on general grounds. In an obstinate case of otitis media occurring in a syphilitic individual there can be no harm in adding constitutional medication to local treatment.

Prognosis of Acute Middle Ear Inflammation.—The prognosis must be considered from two points of view—the general and the local; in other words, the dangers respectively to life and hearing.

All acute inflammations of the middle ear are to a certain extent dangerous. Thus, fatal results from intracranial complications have occurred even in cases of serous catarrh. At the same time the risk to life from even the most severe forms is not great during the acute stage. When, however, the mastoid process is painful, with or without external manifestations, or, when the general symptoms and local pain continue after the tympanic membrane has given way, the prognosis should be guarded. Facial paralysis occurring in the course of acute otitis is not necessarily of serious significance, because it may depend upon a congenital defect in the Fallopian canal. In persons whose general health is below par, the tendency to complications is far more marked than in the robust.

As to the hearing, the prospect is decidedly favourable in mild cases and less so in the graver forms. At the same time, even in the latter, recovery of a very fair amount of hearing power is the rule rather than the exception. When labyrinthine complications set in — manifested by very great or absolute deafness, and followed or accompanied by giddiness—the prospect is extremely grave. As we have seen in certain acute and chronic diseases, the prognosis is materially influenced; but this has already been discussed under the varieties of otitis media which have been described.

The question as to when the disease may be assumed to have become chronic is not easily answered, and is a matter of no great clinical importance. I only mention it here in order to explain that the possible complications and their treatment will be more fully discussed under chronic suppuration.

Treatment.—This must be energetic in proportion to the severity of the symptoms, of which pain is usually the most prominent.

In mild cases, where the inflammation is not severe, the patient should be confined to the house and made to avoid draughts; at the same time alcohol and tobacco should be forbidden. In some cases, too, it is desirable to administer a strong purge, but this is not a necessary adjunct. As the pain usually occurs only at night in the mildest form, an anodyne should be ordered if necessary. Bendelak Hewetson first pointed out the great efficacy of glycerine of carbolic acid, and, in my opinion, this efficacy is still further increased by the addition of cocain. I generally prescribe carbolic acid, cocain hydrochlor. āā gr. 5, glycerin ʒi., 3 drops to be instilled if the pain be severe. Should this fail, the ear may be repeatedly filled with boracic lotion (or some other antiseptic), as hot as can be borne, or the solution may be run into the ear under slight pressure as a continuous stream. Politzer recommends 20–30 drops of a mixture containing equal parts of chloroform and olive oil to be poured upon a piece of cotton wool as large as a saucer and laid over the ear. The same author also recommends warm fomentations covered with oiled silk, or enveloping the whole head with a cloth wrung out of hot water.

It must be observed that all authorities are agreed that poultices are injurious, although for a time relief may be obtained by their use. Instillations of morphia (gr. ii. ad ℥i.) and atropine (gr. ii. ad ʒi.), have also been recommended, while the application of anodyne ointments and liniments to the neighbourhood of the ear is often advocated. As a matter of fact it is unwise to delay long in trying various anodynes. In my own practice I employ leeches whenever the cocain and carbolic instillation fails. From two to four are applied over the mastoid or in front of the tragus, sometimes in both situations. No doubt the latter is, from a theoretical point of view, the most suitable position, because the veins which pass from the drum membrane are thus depleted, but as the bites may leave a visible mark, æsthetic considerations become of some weight, and I suspect that leeching the mastoid is equally efficacious. After the leeches are removed bleeding should be encouraged. When the attack has reached a severity sufficient to warrant depletion the patient should be kept in bed; if the temperature be high antipyrin may be administered, both for its cooling and its anodyne properties. In many cases, too, it is desirable to resort to morphia, chloral, or some of the more modern hypnotics to procure sleep. As a rule very marked relief follows the leeching, but in some cases the pain returns. We have then at our command an almost certain means of arresting it by incising the tympanic membrane—technically spoken of as paracentesis. This operation is more easily performed in acute otitis media than in more chronic cases, because, as a rule, when it becomes necessary the drum membrane is distinctly bulged—usually in its posterior part.

At the same time considerable difficulty is sometimes experienced, even by an operator who has had previous practice because of a tendency on the part of the patient to shrink; for it must be remembered that a very slight movement causes displacement of the reflected light derived from a mirror worn on the forehead of the operator. When it is proposed to perform this operation, the largest possible speculum, which has previously been scrupulously cleansed, should be introduced and steadied with the left hand, which is also so adjusted as to prevent the head of the patient from moving towards the operator, if no reliable assistance be at hand. In the case of children, and sometimes of adults, it is of great importance to have the hands held, as a sudden movement may lead to displacement of the instrument. For the operation I prefer Gruber's knife, which also must be scrupulously disinfected before use. The knife is passed into the meatus, carefully avoiding contact with its walls, down to the tympanic membrane which is rapidly incised. As we have no reliable local anæsthetic the moment of first contact between the bulged drumhead and the steel is one of extreme agony, and it is just then that a movement is likely to occur. It is, therefore, important to complete the puncture rapidly, while an endeavour may be made to secure a degree of anæsthesia by the employment of the carbolic and cocain mixture before referred to. It is usually desirable to make the incision in the posterior and inferior quadrant, as there the distance between membrane and inner wall is greatest, while even if the latter be touched in this situation no irremediable harm is likely to result as the fenestra rotunda is protected by lying at the end of a deep and narrow niche. As in acute cases a mere puncture often suffices to give relief—although, of course, an incision corresponding in length to about a quarter of the vertical diameter of the membrane is better—Woakes' guarded knife may sometimes be employed with advantage in restless patients, or by those who lack experience. After the incision it is, I think, better to cover the meatus lightly with absorbent wool, and avoid further local interference for some hours. Immediately following the incision there is a certain amount of bleeding which soon gives place to a serous, or purulent discharge.

Let us now pause, in order to review briefly the indications for paracentesis. I feel sure that it is a mistake to incise in every case of middle ear inflammation, as seems to be recommended by many authorities. As a matter of fact, those cases in which perforation of the membrane is avoided, on the whole, run the most satisfactory course. On the other hand, under certain circumstances operative interference is most valuable. Thus, as we have seen in diphtheritic, scarlatinal, and probably also in the acute otitis of measles, an early incision, if permissible on general grounds, probably affords the best chance of avoiding sloughing of a large area of the drum membrane. Again, when all our efforts fail to relieve pain, when the membrane is much bulged and presents a whitish area, where spontaneous perforation is imminent, and in the presence of high fever, with head symptoms, incision is distinctly indicated; occasionally, but rarely, even this does not give relief, and the subsequent instillation of cocain may then achieve the desired end. After a free discharge has become established, the ear should be kept clean by frequent syringing with warm boracic lotion (5-10 grs. ad ℥i.), after which it should be gently dried out with absorbent cotton wool. This can be effected in the case of young children by pulling the auricle backwards, and inserting a long wick of this substance; older patients can perform the manipulation most effectively by introducing the wool by means of a wooden match, the end of which is moistened and then surrounded by cotton wool. Exactly the same after-treatment is indicated where spontaneous rupture has occurred.

Whenever the pain has absolutely ceased for twenty-four hours, it is well to begin the daily employment of the air douche by Politzer's method, whether perforation has occurred or not. In the former case, the object of this proceeding is to drive the discharge out of the middle ear, and at the same time to prevent the formation of adhesions. In cases where the membrane is intact, the compressed air serves the same purpose, but also favours absorption of the effused fluid. This process is also aided by methodical massage applied to the mastoid region, and to the part of the neck just below it, the rubbing being always from above downwards, while the application of some unguent, such as lanoline, renders the process more agreeable to the patient. As in these cases, with or without rupture, it is usually desirable to employ compressed air for weeks, it is necessary to watch the sound ear carefully, if the otitis be unilateral. Should undue relaxation of the healthy membrane threaten, the employment of the air douche must be stopped for a time, or the Eustachian catheter substituted. As a rule, each inflation is followed by more or less improvement in the hearing power, especially when the evidences of inflammation are disappearing, and so long as such improvement results, it is desirable to continue the treatment. If simple syringing with boracic lotion (or some other antiseptic, *e.g.*, carbolic (1-50), corrosive sublimate (1-5000)) does not lead to disappearance of the discharge, it may be desirable to employ a more active remedy. No doubt the insufflation of boracic powder, practised after syringing, and drying, is very effective, but, like Schwartze, I cannot avoid the conclusion that certain of my patients had mastoid complications as a result of this treatment. No author can definitely prove his point in such a matter, and I only give my opinion for what it is worth, that in the case of small perforations the insufflation of powders should not be practised lest mechanical obstruction to the outflow of pus should result. If astringents are required, solutions of acetate of lead (5 gr. ad ℥i.) or sulphate of zinc (5 gr. ad ℥i.) may be employed as ear drops. Should the discharge threaten to become chronic, great benefit may often be obtained by a change of air; but of course, the patient must be within reach of some competent medical man.

Before concluding this chapter, it will be desirable to refer to the treatment of certain complications which may set in.

Inflammation of the mastoid should be treated by painting with iodine, cold applications, and leeching. If these remedies fail, an incision down to the bone will often give relief; but the operator must remember that this is merely a palliative of pain, and in no sense fulfils a vital indication. When a distinct abscess forms in this situation, it should, of course, be opened, and that with all antiseptic precautions. It is uncommon to meet with a case requiring opening into the bone, and as the indications for this operation are the same as in cases of chronic suppuration, where they are frequently met with, I shall not at present dwell upon this matter further; the same statement applies to intracranial complications.

Deep-seated pain in the ear, with or without mastoid symptoms, may continue or recur after a free perforation of the membrane has been established. When this occurs, syringing a warm solution of boracic through the Eustachian catheter often gives rapid relief, while Schwartze, in similar cases, advocates mercurial inunction until salivation is produced. It sometimes, although rarely, happens that a perforation in the membrane heals partially or completely before the secretion of pus has ceased; when this unfortunate result ensues, there is no resource but incision, if pain and other symptoms demand it. Indeed, the case must be treated, *de novo,* according to the rules already given.

As the affection often depends upon acute processes in the nose and throat, appropriate treatment must be applied to these parts. The surgeon, too, must not forget that adenoid vegetations in the naso-pharynx are a common cause of recurrent otitis in childhood. These cannot be attacked during the course of the affection, but after convalescence has been established their removal is indicated.

CHAPTER VIII.

CHRONIC SUPPURATION OF THE MIDDLE EAR.

UNCOMPLICATED.

THIS affection is merely a continuance of the disease just described, and we need not, therefore, dwell upon its etiology at any great length. As we have seen, the middle ear inflammation occurring in scarlatina and diphtheria is specially prone to become chronic. Measles also is a fruitful source of chronic suppuration, while in neglected cases the primary form of otitis media, especially in infancy, may give rise to it. In tubercular patients, as we have seen, the tympanum is liable to be attacked, while the otitis of diabetic persons also tends to run an unfavourable course. Some authors have stated that chronic suppuration may—apart from tuberculosis—be established without the intervention of an acute stage. I have certainly seen cases presenting all the objective and most of the subjective phenomena of acute middle ear suppuration run an almost painless course; but this does not seem to warrant the deduction that a chronic inflammation existed from the beginning. Chronic inflammations of the meatus are believed by Walb to give rise to suppuration in the attic of the tympanum, *i.e.*, the space or spaces which are more or less shut off from the lower division of the drum cavity by the ossicles, their ligaments, and various folds of mucous membrane, and to which access is gained from the meatus through the membrana flaccida. According to some authorities this structure has commonly a small perforation, and it is through this foramen of Rivini, as it is called, that Walb supposes the infection of the upper portion of the tympanum to occur in certain cases of otitis externa.

Anatomically all, or nearly all, cases of chronic suppuration have the following points in common, viz., a perforation of the tympanic membrane, and more or less purulent or muco-purulent secretion, thrown off by the mucous lining of the middle ear. The mucosa is also in some degree thickened, and sometimes to such an extent that it seems to fill the tympanic cavity; it is commonly very distinctly reddened, losing the pale yellow colour which characterises the lining membrane of the drum in health. We need not at present further touch upon the pathology of chronic suppuration, as anatomical details will be referred to both in discussing the objective appearances and the complications.

In chronic suppuration there is always more or less *impairment of hearing power,* but the deafness varies within very wide limits. Thus, some patients are very deaf, requiring to be spoken to with a loud voice at close quarters. Others can hear an ordinary conversational tone quite well, and in some instances the impairment is but slight. In chronic suppuration both ears are frequently affected, but commonly their hearing power is unequal. The deafness in these cases depends upon a number of factors, to wit—(1) the presence of a perforation; (2) swelling of the mucosa, or clogging of the ossicles with secretion; (3) destructive changes within the tympanum. Let us now discuss these somewhat more in detail.

A perforation of the membrane *per se* is not a cause of any very marked deafness, but as there is invariably associated with it more or less thickening of the part this acts as an adjuvant. In the case of large perforations occupying the posterior and upper part of the drum-head, the hearing is often very good, as the sound waves impinge directly upon the stapes. When the perforation is small there is a tendency for the secretion to accumulate within the tympanum, and thus considerable impairment of the auditory function is produced. Very often in the same patient the hearing varies because of changes in the amount and position of the secretion. In certain cases all the auditory ossicles have been swept away, and then marked deafness is usually present. In most of these instances, however, the footplate of the stapes remains—as has been shown by anatomical research. As a general rule we may say that if absolute deafness exists it depends upon a collateral disease of the labyrinth.

Pain is not a symptom of uncomplicated chronic suppuration, and will be discussed in the next chapter.

Tinnitus is occasionally complained of, but it is not a common phenomenon; vertigo is rather more frequently met with, but this also is rarely complained of as a leading symptom. Urbantschitsch has pointed out that loss of taste on one or both sides of the tongue is by no means uncommon, but, unless carefully investigated, this phenomenon usually escapes the attention of both patient and physician.

Discharge of pus or muco pus through the perforation is a more or less constant symptom. Sometimes this is extremely abundant—almost flowing from the external meatus, when it is easily recognised by doctor and patient. Frequently, however, the amount of secretion is very small, and, in such cases, the patients are often unaware of its existence, although they may at the same time admit that "the wax has a bad smell." In certain cases the pus only passes through the membrane in very minute quantities and becomes dried, forming dark-coloured crusts—a coloration which may in part arise from admixture of wax. If such masses be found in the meatus and touched with a probe, an intense fœtor is communicated to it, and this odour is often of diagnostic value. In most, if not all, untreated cases of chronic suppuration, the pus is very distinctly fœtid, owing to its tendency to accumulate and decompose in the interstices of the middle ear and external meatus. Very rarely, owing to the presence of certain organisms, the matter assumes a blue or a green colour, as pointed out by Zaufal and Gruber, the coloration being due to the presence of bacillus pyocyaneus (blue) and bacillus fluorescens (green) respectively. In many cases of otorrhœa, the irritating quality of the secretion is shown by the occurrence of eczema and even ulceration of the meatus and adjacent parts.

On inspecting the ear with the reflector, various pictures present themselves; indeed, it is only a slight exaggeration to say that no two cases are exactly similar. Before the meatus has been cleansed, and when the discharge is copious, the secretion prevents any inspection of the deeper parts. When the matter is present in small quantity, we may find the cerumen-like fœtid masses already referred to, or the membrane may be obscured by a layer of thick pus. When this appearance is present, the observer must be on his guard not to mistake it for a thickened tympanic membrane—a mistake by no means improbable. In almost all cases where there is pus in the meatus in the presence of a perforated tympanic membrane the fluid will be seen to pulsate. When this phenomenon is observed, the surgeon will be safe to conclude that the case is one of middle ear suppuration, and the history will suffice to differentiate between the acute and chronic stage. It must, however, be borne in mind that this discovery gives no guide to the actual condition of parts. When the ear has been syringed and dried the speculum will reveal the state of the tympanic membrane.

It is no part of my purpose to describe all the various appearances that may be met with, as this would exhaust many pages as well as the reader's patience. The perforation may be so large as to amount to total loss of the tympanic membrane, or so small as not to be visible. When the whole membrane has disappeared the violence of the primary inflammation may have caused exfoliation of all the ossicles, and the observer then sees a *cul de sac* lined with pink mucous membrane. If the case be of old standing the mucosa sometimes takes on the character of epidermis, so that all differentiation between the walls of the meatus and the lining membrane of the tympanum is lost. In such cases the diagnosis may be established—(1) by touching the part gently with a probe, which, instead of meeting a yielding membrane will encounter the osseous inner wall of the tympanum; (2) by using the pneumatic speculum which, of course, shows no movements of the doubtful surface. Complete destruction of the membrane is comparatively rare. It is more common to have a rim preserved at the upper margin. In this case the handle of the malleus is usually intact but dragged inwards, owing to the unresisted action of the tensor tympani.

When the posterior segment of the membrane is absent, the long process of the incus, the head, and even rami, of the stapes, and the stapedius muscle may be visible in the region of the upper and posterior quadrant. In the same situation, too, may occasionally be seen the chorda tympani nerve, running as a grey line from behind forwards. In the situation of the posterior and inferior quadrant there is often seen a black patch which, on closer inspection, is seen to be the niche of the fenestra rotunda. Smaller perforations of medium size may occur in any part of the membrane. When small they are situated, in my experience, most commonly in the lower part of the drum-head; such small orifices are, however, not uncommon in Schrapnell's membrane.

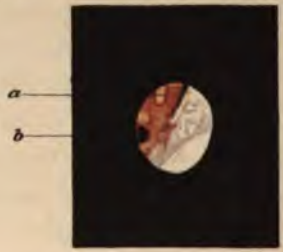

FIG. 27.—Destruction of posterior part of membrane, showing long process of incus (*a*); niche of fenestra rotunda (*b*); and calcareous condition of anterior portion which is adherent to inner wall of tympanum.

The tympanic membrane, or what remains of it, presents various appearances. It is commonly more or less thickened. It may have a fleshy look, or be the seat of calcareous deposits.

Sometimes it assumes an appearance spoken of as polypoid degeneration; in other words it becomes distinctly œdematous, and has the appearance of a polypus. It does not, however, permit of a probe being thrust between it and the wall of the meatus at any point, and is besides more tender than polypoid growths are wont to be.

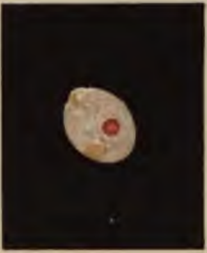

FIG. 28.—Small perforation of tympanic membrane.

In exceptional cases more than one perforation are present in the same membrane. The appearance of the mucous membrane of the tympanum varies; sometimes it is smooth and pink, occasionally it is of a yellowish grey colour as in health, while not unfrequently it is swollen and granular.

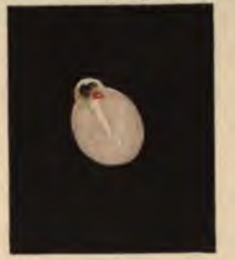

FIG. 29.—Perforation of Schrapnell's membrane (membrana flaccida).

In most cases the *diagnosis* of chronic middle ear suppuration is very simple. In the first place it must be remembered that the discharge of pus from the ear is alone strong presumptive evidence, while, if the column of matter in the ear pulsates, further corroboration is afforded.

The perforation is usually visible, and, when the patient performs Valsalva's experiment, bubbles of air and fluid are seen to pass through it. The same is the case when Siegle's pneumatic speculum is employed. Perforation may also be diagnosed by either inspection or auscultation, while air is driven through the Eustachian tubes. The sound is both heard and felt in the case of large perforations, when the air is found to blow into the auscultator's ear; while, when the orifice is small, the note is whistling, high pitched, and associated with bubbling râles.

The diagnosis of perforations in Schrapnell's membrane is by no means always easy for the beginner, because the orifice is usually small, and the upper parts of the tympanum may be shut off from the lower by the results of the inflammatory process, and thus air driven into the Eustachian tube will not necessarily pass through the perforation. As we shall see later the orifice is often covered by a granulation; but when this is not the case a drop of pus is usually seen lying over the short process. If this be carefully wiped off with cotton wool wrapped round a probe the perforation sometimes becomes visible. In a practised hand it is safe to employ a probe in doubtful cases. It need hardly be said that no force must be employed. The instrument is given a slight bend upwards, and moved with extreme gentleness against the drop of pus, and will then be easily pushed into a cavity without the exertion of any appreciable pressure.

The course of uncomplicated chronic suppuration varies. The suppuration may, under appropriate treatment, and sometimes without it, gradually cease. In this event the perforation may become cicatrised. The appearance of a cicatrix is characteristic. A sharply defined dark-coloured or transparent patch remains. The sharp definition of its margins distinguishes it from the atrophic patches sometimes seen in cases of chronic non-suppurative middle ear inflammation. Not infrequently such cicatrices become adherent, and thus the tympanic membrane and even the malleus become fixed to the inner wall of the tympanum. Occasionally a membrane is met with in which almost all the landmarks are lost, and yet on close inspection the manubrium, or at least the short process, can be distinguished, forming as it were, a focus for cicatricial bands.

Not infrequently we find a very large cicatrix, occupying the posterior aspect of the membrane, so transparent as to show the long process of the incus, the stapes, stapedius muscle, and niche of the fenestra rotunda. Such a scar is occasionally adherent to the head of the stapes; quite commonly, however, no such attachment exists, and on inflating the middle ear the relaxed cicatricial tissue is blown out into a bladder, projecting towards the meatus. Very commonly after cicatrisation has become fully established chalky deposits are developed, and the presence of such calcareous patches in a membrane should lead the surgeon to look carefully for a cicatrix. The pictures produced by cicatrisation are so various that only a prolonged experience will enable the observer to suspect the exact state of matters at sight. It is, however, usually necessary even for the expert, before he can arrive at an exact diagnosis, to call in the aid of Valsalva's experiment, Siegle's speculum, or inflation of the middle ear (if an assistant be at hand), and inspection of the scarred drum-head during the employment of these methods will lead to the differentiation of the mobile or unadherents parts from the fixed or adherent. It is of great clinical importance to note that the hearing power is not necessarily

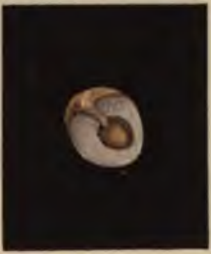

FIG. 30.—Cicatrix involving lower extremity of malleus.

improved after the occurrence of cicatrisation; indeed, it is sometimes worse than before.

In a certain proportion of cases the discharge ceases, but the perforation remains. On the whole this is a less favourable result than cicatrisation, because the mucosa of the middle ear remains exposed, and liable to a recurrence of inflammation.

In a third class of cases the discharge continues in spite of treatment. This is more likely to happen when there is a perforation of the membrana flaccida, as it is then extremely difficult to obtain adequate cleansing and draining — two requisites in the healing process.

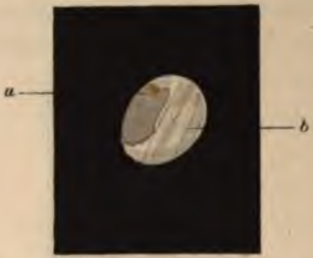

FIG. 31.—Cicatrix occupying posterior portion of membrane, and showing the head of the stapes (*a*), and large chalky deposit of non-cicatrised portion (*b*).

The *prognosis* in chronic suppuration of the middle ear must be considered with reference to (1) life, (2) hearing. With regard to the danger to life, the general principle may be laid down that the freer the drainage the less it is. Thus, when the perforation is large there is less risk than when it is small. Any contraction of the meatus, whether due to hyperostosis or other causes, increases the danger. The most serious cases are those in which the perforation is situated in Schrapnell's membrane. In any given case a history of repeated attacks of pain, relieved by the appearance of discharge, is of evil omen. From a life insurance point of view it may be said that no patient should be accepted as an ordinary life who has a perforation in the tympanic membrane, that if this perforation be small, and still discharging, a very considerable number of years should be added, but if large and with no history of intercurrent attacks of pain, and if further the patient is likely to attend to his ear, 3–5 years will be sufficient.

As to the hearing power, we can seldom speak definitely. If the perforation be large, and the mucosa of the tympanum exposed to view, we can form some idea from its condition as to whether treatment is likely to produce benefit. Thus, if it be much swollen and secreting freely, we may expect to achieve something by restoring it to a healthy condition. Again, the effect of inflation by Politzer's method on the hearing is of considerable value; for, if this manœuvre causes distinct improvement, a possibility of amelioration is thus indicated. Then there always remains the artificial drum membrane to be tried. As we have already seen, the prognosis in such diseases as phthisis and diabetes is not good.

With regard to the *treatment* of chronic middle ear suppuration, I shall first give some general directions which apply to all cases. Cleanliness is of the first importance, and therefore the syringe must be employed, although Von Bergmann has condemned it—without, however, suggesting a satisfactory alternative. The following is the method I generally prescribe for cleansing the ears—(1) Syringe the ear; (2) use Politzer's bag; (3) insert a piece of absorbent cotton wool twisted round a match deep into the ear (a manœuvre which, in the absence of the surgeon, the patient himself must carry out). If the perforation be small, it is also advantageous to use the Politzer's bag before syringing, in order to drive the secretion into the meatus. It is perfectly true, as held by Continental authorities, that syringing through the Eustachian tubes is a useful adjuvant—nay, it is admittedly the most effective mode of cleansing the middle ear. This, however, as a rule necessitates the Eustachian catheter, and, therefore, the presence of the surgeon. In cases where the disease is bilateral, however, it is quite conceivable that an intelligent relative might be taught to carry out Gruber's method of syringing fluids into one nostril with the other closed, and thus succeed in washing out both tympana by way of the Eustachian tubes. Another method much employed by Continental aurists is the introduction of a small bent tube through the perforation, and in this way fluids are injected into the middle ear. This manœuvre has been strongly recommended by Hartmann, and his tubes are those which are commonly employed for the purpose. In certain cases where there is a tendency to the accumulation of inspissated pus—mixed, as it often is, with cholestearin crystals and epithelium—these injections may prove useful. The instillation of a solution of bicarbonate of soda (gr. 10 ad. ℥i.) will, however, often break down such inspissated masses.

When this fails, I have advocated the employment of digestive ferments with a view to softening the hard secretion. I have in this way employed Benger's liquor pancreaticus with the addition of a little soda; and my colleague, Dr. Mackenzie Johnston, has successfully used a 5 per cent. solution of papain.

Let us next consider what solutions are most serviceable for syringing. In all respects the most suitable for most cases is warm water containing boracic acid, ʒi. to half a pint. Other antiseptics may, however, be employed, *e.g.*, corrosive sublimate, 1-5000; carbolic acid, 1 per cent.; creolin, a few drops in a pint of water; permanganate of potassium, and resorcin. The new antiseptic pyoktanin has also been employed, but, as might have been expected, its vivid colour renders its employment objectionable, as pointed out by Ludewig. When it is desired to break down masses of pus, bicarbonate of soda may be used in solution (ʒi.-ʒii. to a pint), or, in case of emergency, common salt may be substituted. Peroxide of hydrogen is also said by some authorities to have very remarkable cleansing properties.

So far, the treatment of every case must proceed upon the same lines. I am, of course, aware that certain authorities have advocated what they are pleased to term the dry method, *i.e.*, the avoidance of all injections, and cleansing the ears simply by mopping up the discharges. I am further aware that Löwe has recently recommended plugging with absorbent cotton wool, in order to keep the parts aseptic and drain by the capillary attraction of the cotton fibres. I cannot, however, believe that such methods are either safe or scientific; therefore, I again repeat that, up to this point, the treatment should be the same, or rather conducted on the same principles. Thus, in one instance, the ear can be perfectly purified by simply syringing; in another, the surgeon must call to his aid the other methods just mentioned, while in each and every case the parts must be thoroughly cleansed. We shall now consider some special methods, as to the employment of which the nature of the case must decide.

The Insufflation of Dry Powders.—Although some of the older aurists employed this method, they used such substances as chalk and alum, which were objectionable, owing to their tendency to cake. To Bezold is due the credit of having suggested the employment of finely-powdered boracic acid. After the ear has been carefully cleansed, a quantity sufficient to cover the tympanic membrane and exposed mucosa of the tympanum is blown in by means of a quill, having attached to one extremity a piece of indiarubber tubing, or by means of a straight insufflator. Other antiseptic powders may be used in the same way, *e.g.*, iodoform, iodol, sozoiodol preparations, and aristol. In cases where drainage is free, and where the perforation is large, this treatment yields most excellent results, but it should not, as a rule, be practised when only a small orifice exists. The insufflations should be stopped immediately any symptoms of pain set in, for, as was first pointed out by Schwartze and confirmed by myself, the routine employment of insufflations in all cases may lead to interference with the escape of pus and symptoms of tension, the most common being inflammation of the mastoid.

The Caustic Treatment.—This method, as advocated by

Schwartze, consists in instilling into the meatus a solution of silver nitrate (gr. 25-50, ad. ℥i.), which is allowed to run into the tympanum, and remain there. Should the perforation be small, Valsalva's experiment or Politzer's inflation is practised while the head is held horizontally; air bubbles are thus driven through the caustic solution in the meatus, and the liquid sinks into the middle ear. After the solution has remained in the ear for a short time, or immediately, if severe pain sets in, an injection of salt water is made in order to neutralise the caustic action, and afterwards the parts are carefully dried, the meatus plugged with antiseptic wool, and the treatment repeated "whenever the eschars have been thrown off." I do not now employ nitrate of silver in this way, although there can be no question that brilliant results may sometimes be attained. In the case of small perforations it does not seem to me safe, more especially if followed—as Schwartze insists that it ought to be—by the injection of salt water. Possible risks from the formation of insoluble chloride of silver behind a small perforation have made me hesitate to employ it in this class of case, and besides, there can be no doubt that such energetic treatment may set up an acute exacerbation. In the case of large perforations, when the mucosa of the tympanum is red and swollen, I frequently apply a strong solution of caustic (gr. 40-60, ad. ℥i.) directly to the parts by means of cotton wool rolled round a fine probe.

Instillations.—Those most in vogue are astringents, or antiseptics with an astringent action. A very excellent prescription is a solution containing sulphate of zinc and carbolic acid (āā gr. v. ad. ℥i.); acetate of lead (5-10 gr. ad. ℥i.), nitrate of lead (5 gr. ad. ℥i.), and glycerine of tannin are also often used. Less commonly prescribed are solutions of sulphate of copper, iodine (recommended by Urbantschitsch in strumous subjects), chloride of zinc, and perchloride of iron—all of which may be employed if desired. Rectified spirit is an extremely valuable remedy, indeed in some cases it is the best of all instillations if only it be employed diluted at first (1-5 of water), and gradually strengthened as it becomes tolerated. Used in this way it is exceptional for any pain to be experienced. It is especially valuable in cases where the perforation is large, and the mucous lining of the middle ear red and granular. Lange has recently advised solutions of lactic acid, of which, however, I have had no experience. Boroglyceride in glycerine, too, has been employed, while Jänicke has recently recorded excellent results following the use of neutral borate of soda, which he prepares by heating equal parts of water, borax, and boracic acid. There can be no question that in the case of small perforations astringent instillations are more suitable than either of the previously mentioned methods of treatment. Of such astringents I would unhesitatingly give the first place to sulphate of zinc, and the second to acetate of lead. What may, however, be considered an open question is, whether or not it is wise to employ remedies of this class when the orifice through which the pus is discharged is very small. In many such cases I am inclined to trust more to syringing with antiseptics, the air-bag, and careful drying—associated, if necessary, with surgical aid, to establish free drainage.

Other Methods.—Gruber has suggested the employment of gelatine bougies, impregnated with various astringent substances, as a method of applying remedies, but the plan has not been received with favour, for the very obvious reason that the egress of pus is thus hindered rather than helped. Beard advocated the constant current as a method of curing the discharge, but no sufficiently satisfactory results have been met with by other observers. Ely practised the transplantation of skin—the pieces being applied to the lining membrane of the tympanum in cases of destruction of the drum-head—as a means of hardening the mucosa. In view of recent observations concerning the etiology of cholesteatomata this line of treatment cannot be recommended.

In cases of middle ear suppuration it is always advisable to attend to the treatment of any gross lesion of the naso-pharynx, if such be present. As we have seen, the use of the air douche in some form is indicated at first in order to cleanse, or help to cleanse, the middle ear. At a later period it is of great importance in order to prevent—so far as may be—the formation of intra-tympanic adhesions.

We must now consider the treatment of such cases as have made progress toward a cure, so far as the discharge is concerned. The most satisfactory result is the formation of a non-adherent cicatrix, without undue relaxation of the cicatrised part. In spite of every care, however, adhesions are prone to occur. In this way the malleus may be bound by fibrous tissue to the inner wall of the tympanum, a large cicatrix occupying the posterior part of the membrane may be attached to the head of the stapes, or the scar may be fixed to the inner wall of the tympanum, and from it may be stretched tense bands in all directions. Sometimes the anterior segment of the membrane becomes adherent in such a way that the Eustachian tube opens into a cavity which is shut off on every side from the remainder of the tympanum. Occasionally the malleus becomes embedded in chalky deposits which interfere with its motion. When any of these conditions have arisen an attempt should be made to rupture the adhesions by means of the air douche or suction. It must, however, be remembered that when successful in accomplishing this object, it by no means follows that any very marked improvement will follow; indeed, sometimes the immediate result is a hæmorrhage into the middle, which causes a temporary increase of deafness. In the case of thin cicatrices, or marked chalky degeneration, this manœuvre may cause a rupture of the membrane, which, however, as a rule, does no permanent harm and may even be followed by benefit. The air douche may be useful even when no adhesion is burst by its employment, as, in certain cases, the stretching action is markedly beneficial. Operative measures have occasionally been followed by good results. Thus, if very marked fibrous bands exist which are rendered tense by the action of the air douche or Siegle's speculum, these may be incised with advantage in some cases. It has been recommended also to cut round an adherent cicatrix (Prout), and to cut through the long process of the incus, and in this way mobilise the stapes (Politzer). In cases where the stapes seem to be fixed by scar tissue, Politzer advises an incision so placed as to restore power of movement to the ossicle. Moure states that he has had satisfactory results from this operation, and others also have recorded successes. Schwartze recommends excision of the malleus and incus where these ossicles are anchylosed or embedded in a chalky mass. It is somewhat difficult to criticise these operative measures at the present time. That the cutting of cicatricial bands may at times do good, that mobilisation of the stapes and even excision of the malleus and incus have been followed by improvement, is established beyond a doubt. At the same time it is no light matter to expose the patient to the risk of a recurrence of a suppurative process, which has perhaps taken years to heal, and that for an operation which may improve the hearing power, which may make no difference, and which is not unlikely to do harm. At present every operation of this kind must be looked upon as an experiment, and should never be thought of except in extreme cases of bilateral deafness. It should, therefore, always be explained to the patient that the result cannot be in any way assured, and that we have at present no reliable method of determining in which cases good is likely to accrue.

According to Politzer, intermittent pressure exercised upon the malleus by means of a probe, as first suggested by Lucæ, is occasionally of some service, and this method has, at all events, the merit of being less heroic than the operative measures just sketched.

Another possible result of chronic suppuration—as we have seen—is a permanent dry perforation. On the whole, this must be considered a favourable outcome. At the same time the patient must be extremely careful not to let water gain entrance to the ear, for in these cases the mucosa is peculiarly intolerant of fluids, which may set up a recurrence of the suppuration. Such recurrence may also arise from cold, so that a relapse may at any time set in. When a dry perforation exists it is important to watch the case, and if any tendency to the formation of adhesions be noticed the air douche must be used to counteract it. Various methods have been advocated with a view to stimulating such perforations to heal. It is a somewhat curious fact that in most cases such well intended efforts result in failure and sometimes lead to a return of the suppuration as well; while the establishment of a permanent opening in a thickened or normal membrane is almost impossible. In perforations which remain after chronic suppuration the margins become covered with epithelium, and thus closure is prevented; but even if the edges be cauterised or excised it is by no means probable that the opening will close. Some successes have of late been obtained by Berthold's myringo-plastic method. A piece of sticking plaster is first laid over the perforation, and then pulled off with a view to causing irritation of the margins. After this a piece of skin is removed from the arm or other part and applied to the orifice, and the ear carefully plugged. Recently the same authority has employed the skin of a hen's egg in place of human cuticle. On the whole, this form of treatment has not acquired much popularity.

The Artificial Tympanic Membrane.—In all cases of chronic suppuration, when considerable deafness remains after the discharge has almost or entirely ceased, it is desirable to experiment with one of the forms of artificial membrane. Unlike most discoveries in medicine, the first form of so-called "artificial tympanum" is that which is still found most useful. In 1841, Yearsley met with a patient who was enabled to improve his hearing power by the introduction of a roll of paper down to the perforated tympanic membrane. Yearsley thereupon experimented in similar cases, but substituted a pellet of moistened cotton wool. Eight years afterwards, Erhard, without, according to Politzer, knowing of Yearsley's work, made similar observations. In 1852, Toynbee proposed the use of an indiarubber disc attached to a wire—an apparatus still occasionally employed. Field has modified this appliance so that between the indiarubber and the membrane there is a layer of cotton wool, which can be medicated with any desired solution. Gruber employs discs of indiarubber and linen, but substitutes a thread for the wire—a very decided advantage; this form of artificial membrane, however, requires a special apparatus for its introduction. Recently Cousins has recommended a very convenient and easily introduced variety, while Blake advocates the employment of small pieces of wet sized paper.

It will thus be seen that quite a number of forms have been suggested by various authorities, not to speak of those sold by quacks, by some of whom a lucrative trade is carried on. It is true that there are some instances in which one variety will answer better than another, but in the majority of cases the moist cotton wool pellet is alike the most convenient and the most efficient. There can be little doubt that the efficacy of this—as of all the forms—depends chiefly upon the pressure exerted. No doubt in most cases an increase of pressure on the stapes is the object to be aimed at; but, as Knapp points out, the opposite result may be attained by applying the pressure to the region of the short process.

It is impossible to tell, excepting by experiment, whether any given case will be benefited or not by the cotton wool pellet (or any of its substitutes). It is most commonly successful in the case of large perforations involving the posterior superior quadrant, and exposing the stapes. In this class of cases the best results are attained by placing the pellet upon the stapes, or, if this be not visible, in a position corresponding to the posterior superior quadrant. In employing the artificial membrane—in whatever form—it is not enough to apply it simply, but a slight pressure must also be used.

In patients who experience sudden changes of hearing power, and who hear better when some liquid is poured into, or present in, the ear, there is a probability of benefit being derived from an artificial membrane. It is an interesting fact, however, that in some persons a drop of glycerine will cause improvement which cannot be obtained by the employment of any solid body. This clinical fact induced Michael to try the effect of glycerine covered by a layer of collodion to keep it *in situ*. The only objection to this method is that it cannot be employed by the average patient.

In employing a cotton wool pellet, various shapes and sizes should be experimented with, and the fluid used for moistening it should be possessed of antiseptic properties. It is, of course, essential that the patient should learn to introduce the cotton wool for himself, and, with this object in view, he must be furnished with very delicate forceps on the pattern of dissecting forceps. It is always well to begin the lesson with a large and elongated piece, so that the tympanic structures are protected from the extremities of the instrument, and also because a pellet of this shape is more easily extracted. When the art of introduction and removal has been once acquired, progress is rapid, and the patient can usually apply and shape the pellet to suit his case better than the aurist.

Every form of artificial drum has the objection of being a foreign body, and is, as such, liable to cause irritation. It should, therefore, be worn only for a short time at first, until the ear has become accustomed to its presence. I generally advise one hour a day for a week, then two for another week, and so on. Under all circumstances, it must be removed at bed time, and given up altogether should the discharge reappear in quantity, or pain occur. It sometimes happens that a patient, who has for years worn an artificial drum, suddenly finds that he cannot place it so as to improve the hearing. The surgeon will then usually find that the tympanic mucosa has become swollen or granular. The attempt to introduce the drum should be given up and suitable treatment applied; after a few weeks the patient will, so far as I have seen, be again able to go on as before. I have so far written of the cotton wool pellet, but the remarks apply, *mutatis mutandis*, to all the other varieties which have been mentioned.

I do not think that this method of *treatment* should be employed, excepting the discharge has almost ceased, and the deafness is considerable. Unless in exceptional circumstances, it is undesirable to use the artificial drum where the deafness is unilateral, and in children, of course, its employment is not possible until the patient has reached the years of discretion.

CHAPTER IX.

COMPLICATIONS OF CHRONIC SUPPURATION.

THE OCCURRENCE OF PAIN.

WHILE in acute inflammation of the middle ear pain is a usual and comparatively innocent symptom, the same phenomenon arising in the course of chronic suppuration is always of grave import. It is true that in certain cases a subacute exacerbation, associated with increased discharge, may give rise to the symptom in question, without necessarily indicating a threatening of grave complications, but even then it is well to regard the case with suspicion. When a patient complains of pain, and when, at the same time, there is a history pointing to diminution or cessation of a previously existing discharge, danger is imminent. If, on examining the ear, there be found inspissated pus, crusts of intensely fœtid odour, or some mechanical obstacle to the flow of secretion, no time should be lost in adopting energetic treatment. As we shall see, many of the complications about to be described are associated with pain. This symptom, however, if early noticed and if properly treated, may prove the salvation of the patient, for pain usually means imperfect drainage. The prognosis as to life in chronic suppuration is always worse when there is a history of repeated attacks of earache.

The *treatment* must be conducted on lines which will tend to favour drainage. Thus, if inspissated pus be seen instillations of bicarbonate of soda, or of solutions containing one of the digestive ferments may prove useful. If a small perforation be present it is often well to enlarge it; unfortunately, however, this proceeding only gives temporary relief as it is impossible to prevent the margins of the fresh incision from reuniting.

At the same time this little operation, when immediately followed by the injection of warm boracic lotion through the Eustachian tube, often acts like a charm. If the orifice be large enough to permit of free drainage, such syringing through the Eustachian tubes will often alone suffice to allay the pain. When, however, all these methods fail to give relief, and when the pulse and temperature are such as to indicate danger (see end of chapter) no time should be lost in securing free drainage. If the perforation be situated in Schrapnell s membrane, as it often is in obstinate cases of this kind, it must be remembered that syringing through the Eustachian tubes may be of little avail, because, not uncommonly, the attic or upper part of the tympanic cavity is shut off from the tympanum proper. Even if a paracentesis knife be inserted into the perforation, and the membrane be slit from above downwards, only a temporary effect is produced. It is for such cases that Continental aurists have so largely advocated operative interference. It is their practice in the first place to inject the cavity into which the perforation opens by means of Hartmann's tube, and if this fails to effect relief, other means are resorted to. As Politzer points out the hearing power is often very good where Schrapnell's membrane is perforated, so that it is better to try in the first place what can be accomplished by means of the introduction of a small sharp spoon, and scraping away the margins of the tympanic ring—if, as is often the case, they be softened—this process being followed by syringing. Schwartze and others advocate the excision of the membrane and malleus, which is often affected by caries, when these parts interfere with free drainage, whether the perforation be in Schrapnell's membrane or not. This is a difficult operation, and cannot be carried out when the meatus is narrowed. The membrane is cut away at its margins, a blunt hook-like knife is next introduced just behind the upper part of the malleus, so that the extremity of the instrument points upwards, and its cutting edge forwards; in this way the tendon of the tensor tympani is cut. The articulation between the incus and stapes is next attacked, and finally the malleus and membrane are extracted by means of a polypus snare. As a rule the incus is left, but by some operators it is considered desirable also to remove this ossicle, and special instruments have been devised for the purpose. I must say that this operation is extremely difficult, because after the first incision the circumscribed field tends, in spite of our efforts, to become so covered with blood that accuracy as to points of detail can hardly be attained. This has recently been recognised by Stacke, who performs the operation after detaching the auricle from behind. He is thus enabled to operate with comparative ease on the deeper structures, and in cases where the attic or roof of the tympanum is chiefly involved, he chisels off a portion of the tympanic ring. In operating Stacke employs a special apparatus in order to protect the stapes. For my own part I am rather inclined to favour scraping out the contents of the tympanum with a sharp spoon, a proceeding recommended by Bergmann (in association with removal of the upper wall of the meatus) and I believe practised by Trautmann without removal of any part of the auditory canal, in cases where such energetic measures are required. Further details as to modes and methods of attaining drainage will be discussed when mastoid inflammation is considered. In certain cases the egress of pus is prevented by polypi, granulations, and exostoses. Under such circumstances operative removal of the obstruction is imperative if the general symptoms threaten danger.

FACIAL PARALYSIS.

The occurrence of facial palsy, as a complication of chronic suppuration of the middle ear, is by no means uncommon. In these cases the prognosis is always doubtful, because we have no means of differentiating the favourable from the unfavourable variety, excepting by the course of the affection. Facial palsy may be caused merely by inflammation of the neurilemma, due to extension from the tympanic cavity, or there may be caries of the Fallopian canal, associated with irreparable destruction of the nerve. It has already been mentioned that the chorda tympani is frequently paralysed in chronic suppuration, hence no deductions as to the situation of the paralysing lesion of the facial can be drawn from the absence of taste on the anterior half of the tongue.

Treatment must be directed towards securing free drainage in cases where facial palsy occurs, while it may be desirable to endeavour to keep up the nutrition of the facial muscles by means of galvanism and friction.

GRANULATIONS AND POLYPI.

Granulations are very frequently met with in middle ear inflammation. Histologically they may be described as œdematous lowly organised connective tissue. To draw a distinction between granulations and polypi is a somewhat arbitrary proceeding at best. There are, however, two forms to which the term is commonly applied, viz.:—(1) Sessile, red, uneven-looking growths, bleeding readily when touched, and springing from the walls of the tympanum or margins of a perforated membrane; (2) similar tissue surrounding a sinus, or springing from a drum cavity in which the presence of carious bone can be demonstrated. In cases of perforation of the membrana flaccida a pedunculated growth is often met with, which no doubt arises from irritation caused by retained secretion or the presence of dead bone.

When the tympanic cavity contains granulations there is commonly a history pointing to the occurrence of bleeding from the ear, which is also readily induced by syringing. On inspection the presence of the characteristic red granulation tissue is easily determined. When manipulated with a probe it is usually found to have a somewhat broad attachment, and bleeds very readily when touched. In very old-standing cases the granulation tissue seems to undergo fibrous degeneration, and the tympanum may become filled by a resistant fibrous mass. In cases where the granulations are caused by the presence of dead bone, they are more exuberant than when they simply result from the irritation produced by the suppurative process. The former, too, tend to recur with great rapidity after removal.

Granulations surrounding a sinus may occur in any situation, but the two most common types are met with in the tympanic membrane and external meatus.

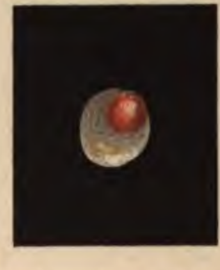

FIG. 32.—Polypoid granulation arising from region of Schrapnell's membrane.

As before stated, perforations of Schrapnell's membrane are often associated with the presence of a granulation, which not uncommonly takes a true polypoid form. Again, in cases where there is a small perforation of the lower segment of the drum membrane, the orifice may assume the form of a pouting sinus, while the adjacent portions of the membrane become raised, œdematous, and red. This appearance is sometimes liable to be mistaken for a true polypus, but the employment of the probe shows that the mass is sessile. When the whole membrane is involved in the œdema we have a condition produced which has been called polypoid degeneration. The malleus is lost to view, and only a convex red mass is seen, while the perforation may cease to be visible. The diagnosis can be arrived at by gently using the probe, which cannot, without undue violence, be made to pass the supposed growth. Further inspection, while the Eustachian tube is inflated, usually shows that there is a perforation in the red œdematous mass.

Another form of granulation which is, I believe, commonly associated with caries of the mastoid, appears as a tumour springing from the upper and posterior wall of the meatus, and having either the bright or bluish-red colour presented by œdematous connective tissue. If this growth be seized in a snare, a portion of it may come away, or it may simply collapse, its subsidence being associated with the discharge of some purulent matter from a perforation in its centre. Even if the operator has succeeded in removing a considerable portion of the tumour, in the space of a day or two it will be found as large as ever. If a probe, bent at a right angle a quarter of an inch from its extremity, be pressed upon the most prominent portion of the granulation, it will pass readily into a sinus leading towards the mastoid cells, and will often encounter bare bone. In fact, the presence of such a granulation is strong presumptive evidence of preceding mastoid inflammation, the history of which can usually be elicited.

It will be seen that, considering the varied etiology, no fixed rule for *treatment* can be laid down applicable to all cases. Thus, where the granulations are dependent upon the presence of dead bone, little good can accrue from their removal; for in these cases, if relief of tension is urgently required, this will not suffice, and besides, so long as the cause remains, it is useless to attack the granulations. These cases, then, must be treated on the lines about to be laid down in subsequent sections.

Where the granulations are simply the result of the suppuration, the methods of treatment mentioned in the preceding chapter may suffice. Alcohol, as an instillation, is particularly serviceable in these cases, while Lange recommends lactic acid in 15 per cent. solution. If this fails to effect a cure, other methods must be resorted to. When a pedunculated tumour is formed, neither the pathology nor the treatment differ materially from that of polypus, as presently to be described. Sessile granulations may be destroyed, according to circumstances, by (1) caustics; (2) scraping.

Of the former, I consider chromic acid the best, a bead of which is fused on a delicate roughened probe. If the patient be very nervous, a little cocain (10 per cent.) may be first applied, but, as a rule, I prefer to do without it. If the chromic acid be applied only to the granulations which are not usually sensitive, the pain at the moment will be *nil*, but afterwards a certain amount of discomfort occurs, varying from slight to extreme pain. The amount of this subsequent pain seems to indicate the extent to which the caustic has overrun its limits and attacked healthy parts, and hence a valuable indication is afforded, which is lost if cocain be used. The patient should always be kept under observation for half an hour, or, if this be not possible, supplied with the means of arresting the action of the chromic acid. This can be done instantaneously, in most cases, by the instillation of a solution of bicarbonate of soda, which should be employed whenever the pain is very severe. Politzer strongly recommends liquor ferri perchlor. as a caustic application. My own experience of this remedy has been that it is by no means very efficient. Even if the salt itself be applied to the granulations, its action is much less satisfactory than that of chromic acid. The same author also strongly urges the employment of the electric cautery, and no doubt excellent results may be thus obtained. We must, however, consider how near the parts to be cauterised are to vital structures. I myself never use this method of treatment in dealing with ear cases, if it can be avoided, for it seems to me that the radiated heat may not be always quite without danger to the meninges. Scraping with a small sharp spoon may also be employed to remove granulations, as recommended by Wolff.

True Polypi.—As has been already stated the difference between true polypi and granulations is, in most cases, arbitrary. In the immense majority of instances these growths are not only associated with, but directly due to chronic suppuration of the middle ear. Polypi have, however, been observed which originated behind a previously intact drum membrane, and which eventually protruded through it into the meatus.

Polypi are usually stated to arise from either the mucosa of the middle ear, the tympanic membrane, or meatus. I have, however, rarely seen a polypoid growth which could not be definitely proved to be a granulation, associated with the presence of a sinus or furuncle, arising in the last-named situation.

Aural polypi vary greatly in size and shape. They may be little larger than a pinhead, or they may be of such a size that they not only fill but protrude from, the external meatus. In shape they may be globular (the surface being either smooth or uneven, "raspberry polypus" of older writers), pyriform, with the broad end outwards, or dendriform. In the last-mentioned variety a common root gives rise to a number of leaf-like processes. Aural polypi may be of a bright red colour or of a paler bluish-grey shade, but occasionally portions of the tumour are of a dark bluish-black colour, and microscopic examination then reveals the presence of dilated blood spaces—in fact, an angioma. When the growth is of sufficient size to protrude from the meatus the exposed part may take on the appearance of epidermis.

A few words as to microscopic characteristics must now be added. It is asserted by not a few authorities that a given growth is a true polypus or a granulation according as it has or has not a coating of epithelium, which may be of various kinds in the same specimen; thus, the deeper portions may have a coating of ciliated, while the outer parts are covered with squamous epithelium. In microscopic sections quite a number of appearances may be met with, all of which can, however, be very simply explained. Soft and recent growths, characterised by their bright red colour and tendency to bleed when touched, consist chiefly of round cells. In older polypi, often bluish-grey in colour, many of these round cells are changed into spindles, and so a fibroma is produced. Occasionally myxomatous degeneration takes place in patches, and sometimes even the whole tumour consists of branching cells (myxoma). Cavities lined by epithelium are often met with, representing sections of glands which, when numerous, may still further complicate nomenclature by adding adenomata to the already formidable list. Occasionally one of these cavities becomes distended with fluid, and leads to the formation of a cystic polypus. Sometimes dilated vessels and vascular spaces give rise to the macro- and microscopic appearances characteristic of angioma. Cassells, Bezold, Hedinger, and Politzer have also found bone in the substance of an aural polypus, while Moos, Steinbrügge, and Wagenhaüser met with cholestea tomatous masses in a similar situation.

The *symptoms* of aural polypi vary considerably. As in the case of granulations, bleeding from the ear is common. Frequently these growths are discovered on inspecting an ear, when the complaint is either of deafness or discharge. If the polypus be of large size, it may cause pain from retention of pus behind it, and grave cerebral symptoms are sometimes occasioned. Of these, giddiness is the most common; this may be associated with nausea, and recur whenever the patient raises his head. Schwartze describes a remarkable case where ptosis with paresis and partial anæsthesia of the same side, together with giddiness and nausea, disappeared after the removal of several polypi.

The *diagnosis* of polypus is usually easy. A growth corresponding in appearance to one of the forms already described is seen in the meatus; a probe can be passed freely round it, and during this process the polypus gives evidence of its mobility.

From a recent observation by Politzer it would seem that a polypus may occasionally become adherent at its margins to the meatus, and thus give rise to closure of the passage. While this process is going on, and after its completion, the diagnosis of the condition may be extremely difficult, if not impossible, unless the various stages have been watched; such cases are, however, of extreme rarity. The tympanic membrane may, as we have seen, sometimes become œdematous and simulate a neoplasm. The position of the supposed growth, its extreme sensitiveness, and the inability to pass a probe beyond its margins will assist diagnosis. Granulation tissue due to diseased bone can, when recognition is possible, be recognised by the careful use of the probe and its rapid recurrence. Very rarely granulation tissue may appear at the orifice of a furuncle; but the history of the case and the situation of the growth will prevent a mistake. Condylomata occasionally appear in the meatus of syphilitic patients, and should not be confounded with the growths under consideration. Malignant disease of the middle ear almost invariably appears at first as polypoid or granulation tissue. It is, perhaps, more likely to be confounded with granulations due to diseased bone than with polypus proper, on account of its rapid recurrence after removal. The microscope will, in doubtful cases, have to be employed in arriving at a diagnosis.

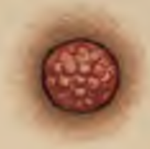

FIG. 33.—Large polypus.

The *prognosis* of aural polypus is, as a rule, satisfactory if care and proper treatment be employed. So long as the growth exists, there always remains the danger that its presence may interfere with the discharge of pus from the tympanum. In estimating the probable improvement in hearing likely to follow removal of the growth, it is well to be guarded, for the condition of the deeper parts cannot be made out, although, wherever there is a polypus, we may premise the existence of a perforation and suppurative otitis media. As a rule, a certain amount of improvement follows treatment, but many exceptions are met with. In almost all cases, the discharge is very considerably reduced after removal of the growth.

The *treatment* of aural polypi is comparatively simple, although its proper execution requires manual dexterity. Politzer lays considerable stress upon ascertaining the exact origin of a polypus before proceeding to operative measures, but I fail entirely to see the necessity for this. When small growths spring from the upper part of the tympanic ring, simple inspection suffices. When the tumour is large, no amount of probing will enable the operator to judge of its exact attachment.

In the case of large polypi, Wilde's snare, or this instrument as modified by Blake, is most serviceable. As these are somewhat large, it is useful also to have a snare of more delicate make, which may be armed with very fine copper or silver wire, for the removal of small growths. In the ordinary snares, soft iron wire is used. Before operating, a drop or two of 10 per cent. solution of cocain may be instilled into the meatus and allowed to remain in contact with the deeper parts for five minutes. In the case of large growths easily seen, it is better not to employ a speculum; but if this instrument be found necessary, the largest possible, consistent with the lumen of the meatus, should be introduced. A loop corresponding approximately to the size of the growth is now made at the extremity of the snare, which is then introduced so as to encircle the tumour. When this has been accomplished, the instrument is pushed on until an obstruction is met with, and then tightened. In the soft varieties of polypus, this action usually amputates the eled portion, but when the growth is of harder consistence, k may be necessary to bring it away. To the exercise of traction there are various theoretical objections, but I do sitate to recommend the method.

er the operation, free hæmorrhage usually occurs; but it lways be controlled by plugging the meatus, if necessary, desists of its own accord in a short time. It com- happens that after the operation either another polypus or a portion of the growth attacked remains. If this be nough, or if a second tumour be present, the snare must n introduced. When so much as is possible has been by the snare, the pedicle should be destroyed by acid. Several applications of this caustic at inter- about a week may be required to accomplish this ly. Nitrate of silver, perchloride of iron, and the autery may also be used; but what has previously as to these caustics may be taken to apply here.

where after-treatment cannot be supervised by the uch can be accomplished by the employment of ns of rectified spirit by the patient. As was pointed ndently by Politzer and myself, alcohol has a very tion on aural polypi—more especially upon the softer Indeed, small growths may sometimes be caused ar in this way without resort to operation. The obably two-fold; alcohol abstracts moisture, and, at me, coagulates albumen. Large tumours, although considerably reduced in size, do not, as a rule, tirely under its action. As a means of preventing owever, this treatment is very valuable, and should for some time, even if the patient has been able to ufficient number of cauterisations.

polypi are of such small size that they cannot red. In these cases I have found their removal ng knife very easily accomplished. This instru- te ring attached to a shaft, and having its inner edge sharp. It is pressed against the small polypus, which is, if possible, made to enter the ring and quickly withdrawn. I have found in using this instrument that it is, as a rule, not necessary that the knife should surround the growth, as the cutting edge embedded in the soft tissue usually gives sufficient hold to enable the operator to wrench it from its attachment. If a small neoplasm be so situated that it cannot be attacked by either of the instruments named, it can easily be destroyed by repeated applications of chromic acid.

These are the methods upon which I depend, and which have always served my purpose. Toynbee used to employ an ingeniously constructed forceps (technically "lever ring forceps"), while Politzer, in cases where other methods fail, breaks up the tumours with serviceable, strong, and simple forceps. Clarke has successfully treated polypi by means of interstitial injections of liquor ferri perchloridi; but Urbantschitsch has seen very severe reaction follow this method of treatment, although he admits its success. Lucæ recommends powdered sabine and alum in equal parts as a caustic, while Hinton saw good results from liquor plumbi. The electric cautery has already been referred to, and it only remains to add that Gomperz has employed electrolysis for the purpose of destroying polypi.

It is hardly necessary to add that after granulations or polypi have been removed, the case must be treated on the lines indicated by the chronic suppuration which has caused them.

EXOSTOSES.

These may be occasionally seen springing from the inner wall of the tympanum, as a result of the long continued chronic inflammation. They are of clinical importance in so far that the egress of pus may thus be interfered with, and one of the operative measures described in a subsequent section may then become necessary.

MALIGNANT DISEASE.

It may at first sight appear out of place to consider malignant disease as a complication of chronic middle ear suppuration, but clinical facts must be my justification.

Malignant disease of the middle ear is extremely rare, even if we include under this heading cases in which a tumour of adjacent structures, *e.g.*, the parotid, has forced its way towards the tympanum.

Carcinoma is distinctly more common than sarcoma. Of the former Kretschmann has collected sixteen published cases, and among these the disease appeared twelve times after long standing chronic suppuration.

The *symptoms,* according to this author, are pain frequently associated with vertigo, while the discharge is often mingled with carious *debris.* Facial paralysis seems to be a constant symptom. On examining the ear the surgeon will find in the early stage of the disease quantities of granulation tissue, which bleeds readily and recurs rapidly after removal. Affection of adjacent lymphatics is by no means constantly associated with the disease, but in its later stages swelling and infiltration appear around the ear, usually in the mastoid region. Commonly this becomes softer and either breaks down or is incised —the condition being often mistaken for inflammation. Small quantities of grumous discharge are soon followed by the appearance of fungating tumour masses, and the area of the destructive process gradually extends until adjacent parts are attacked and destroyed. It must be remembered that extension inwards towards the cerebral cavity may also occur. Death from exhaustion, meningitis, or hæmorrhage, finally terminates an existence which has ceased to have any attractions.

The *diagnosis* is fraught with much difficulty, and, as a matter of fact, is generally only arrived at late in the disease. The intense pain, rapidly recurring granulations, and fœtid discharge, may all be present in caries of the temporal bone. It is only at a later stage, when fungating masses have forced their way through the mastoid, that the nature of the case can be ascertained without resort to the microscope. In all doubtful cases some of the exuberant granulation tissue should be removed and subjected to histological examination, which in cancerous disease will usually show epithelioma.

The *treatment* must be purely symptomatic. The pain should be relieved by local and general remedies, *e.g.*, cocain locally and morphia internally. While a discharge is extremely fœtid, antiseptic syringing and dressings are necessary for the comfort not only of the patient but of his surroundings.

While cancer usually attacks those of middle age or over it, *sarcoma* of the middle ear is met with in children or very young adults. It may follow long continued suppuration, but, according to Schwartze, usually attacks a previously healthy ear. This author believes that the disease commonly originates in the dura mater, and then forces its way into the tympanum. In a case observed by Pomeroy there was reason to believe that the tumour had originated in or near the Gasserian ganglion. In several cases of aural sarcoma symptoms pointing to involvement of intracranial nerves have been met with. As regards the ear, a growth, usually at first mistaken for a polypus, appears either in the course of a chronic suppurative otitis media, as in a case recorded by Haug, or after a slight serous discharge (when the ear has been previously healthy). The subsequent course of the disease is similar to that of carcinoma, only more rapid—the average duration of life being, according to Schwartze from 6 to 8 months. The early *diagnosis* can only be made by means of the microscope.

Treatment can, as a rule, be only palliative; at the same time it must be remembered that sarcomata elsewhere have been successfully extirpated from regions as inaccessible as the middle ear—to wit, the larynx by endolaryngeal operation. For this reason, if the case be early seen and recognised, an attempt may be made to remove all the tumour mass, and subsequently to destroy the base with caustics. As against the probable success of such attempts must, however, be placed the fact that the sarcoma is likely to have its origin in the cranial cavity.

CARIES AND NECROSIS.

Caries and necrosis of the temporal bone and ossicles are usually the result of chronic suppuration of the middle ear, but occasionally occurs during the acute stage. As we have already seen, certain forms of inflammation are more prone than others to lead to disease of the bone. In scarlatinal otitis media, and when this affection arises in the course of diphtheria, the ossicles are not unfrequently swept away during the acute stage. Again, in cases occurring in dyscrasic persons, *e.g.*, those afflicted with struma, diabetes, phthisis, and syphilis, the bone is more liable to be attacked. Very rarely death of bone results from otitis externa, and occasionally the osseous structures seem to be primarily affected. I believe that the most important factor of caries and necrosis, as these conditions occur in the course of chronic suppurative otitis media, is insufficient drainage for the discharge which collects within the tympanum and mastoid antrum—a subject to which reference will again be made.

According to Gruber, the parts of the temporal bone are attacked in the following descending order of frequency:—(1) The mastoid process; (2) the roof of the tympanum; (3) the external meatus (usually the posterior wall); (4) the inner surface of the mastoid, which bounds the lateral sinus; (5) the floor of the tympanum and the posterior wall of the carotid canal; (6) the labyrinth and petrous portion of the temporal bone proper. Schwartze somewhat alters this order, and from clinical experience I am more inclined to accept his estimate, which is as follows:—(1) Mastoid process; (2) posterior and upper wall of the external meatus; (3) roof of the tympanum; (4) ossicles; (5) inner wall of the tympanum;

(6) groove of the lateral sinus; (7) floor of the tympanum; (8) posterior wall of the carotid canal; (9) labyrinth; (10) internal auditory meatus. Of the auditory ossicles the malleus and incus are more frequently attacked than the stapes; while the foot plate of this bone is rarely exfoliated, owing probably to its protected position and comparatively ample blood-supply, which is derived from both tympanic and labyrinthine vessels.

The *symptoms* and signs of caries and necrosis differ so much that it is extremely difficult to give any detailed account of them. Thus, in certain cases, the existence of dead bone is easily detectable by objective methods alone. When an abscess occurs over the mastoid process, and when pressure on the swelling causes a movement of pus in the deeper part of the meatus, it becomes obvious that a direct communication exists between the middle ear and the abscess, and the surgeon will not usually err in diagnosing a fistula in the bone, although it is, of course, conceivable that simple tension might so far force the squamous from the mastoid portion, in a very young child, as to admit of the passage of pus. After such an abscess has given way, the introduction of a probe will usually reveal the presence of an orifice in the bone; it must, however, be remembered that all bare bone is not necessarily dead. The presence of a granulation springing from the posterior wall of the meatus is usually connected with caries, and, as we have seen, a probe can usually detect a sinus leading towards the mastoid cells. Perforations of Schrapnell's membrane are often associated with caries of the malleus and of the margins of the tympanic ring and adjacent bone, which may be detected by the careful employment of a delicate probe. In not a few of such cases a marked excavation of the bone can be seen, which admits of a view of the attic of the tympanum. Occasionally, when a large perforation is present, carious spots may be found on the inner wall of the tympanum by using the probe.

In a number of cases, however, the actual carious area is not detectable by either sight or touch. More rarely the same is true of necrosis, as, for example, when the sequestrum is embedded in the centre of the mastoid. The surgeon must then draw his conclusions from the following data :—

Pain in the ear is usually present in all cases. This symptom is not always constant, but recurs from time to time, lasting for days, becoming worse at night, and being often associated with diffuse headache. According to Schwartze this pain is usually aggravated by percussion of the bone, and by astringent instillations. In tubercular cases he states that it is often altogether absent, and the same is true of very small localised areas of caries.

The Character of the Discharge.—The pus is often watery, and mixed with masses of cheesy consistence; it is always extremely offensive, having, as I think, a different kind of fœtor from that of a simple neglected otorrhœa, which may, however, be as disagreeable, although of a different quality. In some cases of caries, however, the pus does not show any distinctive character, excepting its great quantity. Thus, in disease of the temporal bone in children, the amount of discharge is sometimes so great that it is difficult to get any view of the deeper parts, as the secretion reappears with extreme rapidity after removal. Microscopic examination of the sediment, which deposits from the fluid used in syringing the ear, may reveal spicules of bone, and these may even be of sufficient size to be felt on rubbing the deposit between the finger and thumb. Chemical examination, too, may reveal the presence of an excess of lime salts.

The Appearance of the Meatus and Middle Ear. — Not uncommonly the meatus is much narrowed, and it may be all but closed, either owing to swelling of the soft parts or hyperostosis. In the deeper parts luxuriant granulations are seen which bleed readily and recur with extraordinary rapidity after removal. In extensive disease, granulations are rarely, if ever, absent, and their presence accounts for the frequency of bleeding from the ear.

Paralysis of the facial nerve, as we have seen, may occur without caries, but it is often due to this cause, and its presence in a case of chronic otorrhœa should render the observer suspicious.

Glandular enlargement and *burrowing of pus* into the structures of the neck and even pharynx may occur.

During the progress of the case, portions of the meatus, mastoid cells, tympanum, or labyrinth may be thrown off as sequestra.

The *prognosis* of caries and necrosis is always extremely doubtful. All the risks to be mentioned in a subsequent chapter threaten the patient. It is, however, noteworthy that young children, in whom the disease is frequently fatal, rarely die from cerebral complications; as a rule they collapse as a result of general marasmus. In infants the prognosis is always very grave, and even if the patient escapes with life, half of the face frequently remains paralysed. Sudden vertigo, which persists, associated with inability to hear the tuning fork, are of unfavourable import, as these symptoms point to involvement of the labyrinth, whence the intracranial structures may be readily infected. Fatal hæmorrhage from erosion of the internal carotid or lateral sinus may occur, but such a catastrophe is uncommon, because, as Gruber points out, the vascular walls near the seat of disease tend to undergo a hyperplastic process.

In the *treatment* of caries and necrosis the general health must be attended to; mercurials internally or by inunction are indicated in syphilitic patients; tonics, cod liver oil, milk, and fresh air must be prescribed for strumous and tubercular subjects. Change of air is frequently of great value, but to attain it the patient has often to be at a distance from skilled aid, which, as we shall see, may be required at any moment in all cases of ear disease in which cerebral complications are liable to supervene.

Local treatment must be conducted on the same lines which have been laid down in the section on pain, and about to be discussed in considering suppurative ear disease, which threatens life. As a general rule the treatment should be energetic, in proportion to the amount of pain, which is usually a reliable guide, and by which we may generally estimate the amount of danger. As astringents are not well borne, antiseptic solutions only should be employed in cleansing the parts. Urban Pritchard advises the injection of ½ per cent. solution of nitric acid in order to dissolve away the spicules of dead bone, while Woakes advocates the employment of sulphurous acid, more particularly in cases where the disease is associated with perforation of Schrapnell's membrane. To me the employment of the digestive ferments has seemed better, because acids must coagulate the albumen of the pus, but even from this treatment brilliant results cannot be expected. In order to relieve pain opiates may be necessary, while Gruber advises the application of the actual cautery to the mastoid region with a similar object.

My own opinion is strongly in favour of operative interference in all cases where there is great pain, and where we can hope to benefit by the establishment of free drainage. It is true that this symptom is often directly caused by ostitis and periostitis in the neighbourhood of the diseased parts, but free drainage will often relieve it, and remove a source of great danger. The nature of the operation required may vary in different cases, but as a general rule opening the mastoid antrum gives the most satisfactory results. Where the petrous bone is known to be affected, even this will not always avail. When there is no pain simple cleansing with antiseptic lotions may, if persevered in, lead to separation of the carious particles and restoration to health. In cases of necrosis, sequestra should be removed whenever they become loose.

CHOLESTEATOMA.

According to Virchow this is a true neoplasm, consisting of epithelial cells and cholestearin crystals enclosed in a delicate capsule. Such a growth was found by Lucæ in a case where there was neither inflammation nor perforation, but instances of this kind are extremely rare. What are generally described as cholesteatomatous masses originate only in cases of perforation. According to the recent observations of Habermann and Bezold it would appear that these accumulations owe their origin to the growth of the epidermis of the meatus into the tympanum. Epidermic cells are then thrown off, and white masses, composed of concentrically arranged epidermis, with an admixture of cholestearin and pus, become formed in the cavities of the middle ear—most commonly in the mastoid antrum. These may assume considerable size, and even lead to actual distension or perforation of the osseous walls.

In some cases the white glistening cholesteatomatous accumulations are seen in the middle ear; in others, pain and symptoms of tension occur from time to time, and relief only ensues after the extrusion of hard pellets, resembling an onion in their laminated structure. If such a case be seen when no pain is complained of, or just after this symptom has set in, an attempt may be made to soften the masses by alkaline instillations or the digestive ferments (Benger's liquor pancreaticus or papain). If these methods fail the treatment should be conducted on the lines laid down for the treatment of pain; the general condition must be most carefully watched, as the mastoid may require to be opened at any moment.

INFLAMMATION OF THE MASTOID PROCESS.

Before describing inflammatory affections of the mastoid region, it will be desirable to notice a few anatomical points which, considering their clinical importance, receive scant justice at the hands of British anatomists. It is generally known that the mastoid process is situated directly behind the ear, that its substance usually consists of pneumatic spaces, and that these communicate with the tympanic cavity. It is, however, of great clinical importance to bear in mind certain other facts which will be now shortly mentioned. The air-containing spaces of the mastoid present endless variations; thus, Zuckerkandl points out that in 36 per cent. the spaces all contain air, in 20 per cent. they all contain diploe (that is, there are no pneumatic spaces), and in 42 per cent. some contain air, others diploe.

The air spaces usually communicate with the tympanum through the mastoid antrum, and they may occasionally be continuous with similar spaces in the occipital bone, the zygomatic process, and even the petrous portion of the temporal bone. In exceptional cases the mastoid cells are converted into dense bone of ivory-like hardness. Fortunately there is one anatomical feature which seems never to vary—the mastoid antrum. This is a large cavity which opens into the tympanum at its posterior and upper part. It is present in the new-born infant, and into it open the air spaces, which are subsequently formed.

It is further of importance to bear in mind that the inner surface of the mastoid process contains the groove for the lateral sinus, and that occasionally this large vein lies very far forward. It has been attempted by Körner to deduce the exact position of the sinus by a comparison between the length and breadth of the skull, but his views have not been generally accepted. One other anatomical feature is, when it exists, of considerable clinical value. If the outer surface of the mastoid and adjacent parts be examined in a number of temporal bones, it will be seen that just above the anterior superior corner of the mastoid there is an elevation in a considerable percentage. This elevation seems to be the posterior part of the zygomatic line, and immediately below it is a depression. Even when the elevation (known to anatomists as the spina supra meatum) is not present, the hollow is often distinctly marked. When the spina is present it forms an important guide in the operation of opening the mastoid.

Let us now turn to a consideration of inflammation of the mastoid process. It is usual to divide this affection into—(1) periostitis; (2) empyema of the cells. In only rare instances is such a division justified. Occasionally cases of primary periostitis are met with in this situation quite independent of ear disease; otitis externa, too, may give rise to inflammation confined to the periosteum. In arriving at a diagnosis of periostitis care must, however, be taken not to mistake for it inflammatory irritation of a lymphatic gland which lies over the mastoid. Primary inflammation of the mastoid cells has also been observed, leading subsequently to inflammation of the middle ear and perforation of the drum membrane.

In general, however, inflammation of the mastoid occurs as a complication of acute or chronic middle ear suppuration, with or without caries, cholesteatoma, or polypi. I believe that in acute inflammation the process simply extends to the mastoid cells from the tympanum by way of the antrum; and not infrequently the inflammation reaches the external periosteum. In chronic suppuration mastoid inflammation is generally, if not always, the result of deficient drainage. The pus is dammed back, and seeks an exit, but not unfrequently gives rise to caries or necrosis in the process. Sometimes the mastoid antrum is filled with cholesteatomatous masses which lead to tension symptoms; but such masses are, as we have seen, usually inflammatory products.

Mastoid inflammation is usually associated with considerable rise of pulse and temperature, which may even reach 106°. Usually, although not always, there is great pain, and occasionally there may be diffuse headache and photophobia. When the affection occurs in the course of chronic suppuration of the middle ear, the history often points to a diminution of the discharge having preceded the pain. An examination of the ear may show some obstruction to the egress of pus, and not uncommonly the posterior and upper wall of the meatus is bulging and tender. At the same time the mastoid process is usually both painful and tender to the touch. This symptom is often at first confined to the base—sometimes to the tip—of the bone. After this state of matters has lasted for a time, the parts behind the ear may become red and swollen. The result of this swelling, which extends to the soft parts immediately behind the cartilaginous meatus, is to cause the auricle to stand away from the head, a phenomenon which is often much more marked than the tumefaction. At a still later stage subperiosteal abscesses may form either over the mastoid region, or in the posterior wall of the osseous meatus. Such abscess formation is commonly associated in adults with perforation of the bone, although in the case of children pus sometimes finds its way through the squamo-mastoid fissure. It is a noteworthy fact that, when the internal tension causes the pus to break through the cortex, the point perforated usually corresponds to the situation chosen for opening the mastoid antrum. Such collections of pus, however, occasionally occur in other situations than those mentioned, and we occasionally find a large abscess develop in the parietal region above the auricle. Bezold first called attention to a very serious outcome of mastoid disease, namely, perforation of the process on its inner side, *i.e.*, in the region of the digastric fossa. In this way pus may burrow downwards along the cervical tissues, and may lead to grave results.

The *prognosis* of mastoid inflammation is always grave, excepting in cases where only the periosteum is involved, *e.g.*, primary periostitis or inflammation following otitis externa. When the affection follows acute middle ear inflammation it usually runs a more favourable course than when it occurs as a complication of chronic suppuration. In very young children extensive death of bone is by no means an infrequent result, and the patients may succumb to general marasmus from exhaustion. In adults the chief risk is from head affections, which will be again discussed. So far as my experience goes the danger to life is inversely proportionate to the external evidences of inflammation. Looked at from a practical point of view the danger of head affections is roughly in proportion to the amount of inward tension of the inflammatory products. When external periostitis occurs we may assume that the greatest pressure is outwards, and the formation of a subperiosteal abscess may thus be followed by distinct relief. Even when these abscesses have been opened, however, the danger cannot be considered past, as the safety of the patient depends only upon the presence of a small fistula in the bone. When the inner side or tip of the mastoid gives way a fatal result is comparatively common.

The *treatment* of mastoid inflammation must be conducted, to a great extent, on the lines already laid down, in order to secure free drainage. To recapitulate briefly the more important methods which may be required:—Polypi or granulations, if present, should be removed; a small perforation must be enlarged; the middle ear should be irrigated through the Eustachian catheter; hard masses of secretions are to be softened and removed. The local measures applicable to the mastoid process itself are blood-letting, the application of iodine, and cold. Whenever tenderness or swelling become evident, two or three leeches should be applied, and the bites must be allowed to bleed freely. It occasionally happens that one of the wounds involves the lymphatic gland which lies over the mastoid; if this should occur, it may be followed by a slight amount of lymphadenitis, but even then the deep-seated pain is commonly distinctly relieved. If little or no relief follows leeching, cold should be applied, either in the form of an ice-bag, or by means of Leiter's coils; and when the leech-bites have healed, iodine (tinct. and liniment in equal parts) may be painted over the part. If all these methods fail to procure cessation of the pain and febrile movement, which usually accompanies it, an incision should be made over the mastoid, extending down to the bone—a proceeding known as Wilde's operation, and named after the celebrated Dublin aurist who first proposed it. A good deal of misconception exists among surgeons as to the value of this operation. It relieves pain, by diminishing tension on the outer surface of the bone; it further exercises temporary benefit when inflammatory products have been retained in the antrum and have set up irritation in the mastoid cells. In no case, however, can Wilde's incision actually aid in the drainage of the tympanum, unless pus has already found its way from the middle ear to the outer surface of the mastoid process. Wilde's incision should be made about a quarter of an inch behind the attachment of the auricle, and should extend from near the tip to the base of the mastoid. It is usually advised to make the cut half an inch behind the attachment of the auricle, but the distance first mentioned is usually sufficient to avoid injury to the posterior auricular artery, and being nearer the external ear it can more readily be utilised should a subsequent operation upon the bone become necessary. In making the incision the knife should always be carried from below upwards, in order to avoid any chance of its point slipping into the tissues of the neck. In cases where there is marked inflammation of the external periosteum, the operator will often be surprised at the thickness of the soft parts which have to be severed before the bone is reached. When pus has already formed, no time should, of course, be lost in opening the abscess, and after this has been accomplished, the bone—which will generally be felt bare—should be carefully examined with a probe, in order to ascertain whether there is a fistula leading towards the middle ear. In those rare and dangerous cases, where the inner side of the tip of the mastoid process is perforated, pus may find its way down the neck, and such abscesses must, of course, be opened and drained. As we have seen, pus may also be found in the parietal region, and, rarely, cases are met with where the matter points towards the pharynx. In many cases, further treatment is required in the shape of an operation on the bone.

Opening into the mastoid cells has long been a recognised surgical procedure, but for the indications for, and method of, opening the mastoid process now usually adopted, we are mainly indebted to Schwartze. The actual method of operating we shall presently describe, but it may be well to mention here that the operator aims not only at opening into the pneumatic spaces, but at reaching the mastoid antrum.

The indications for operation which Schwartze lays down are as follows:—

(1) Acute inflammation of the mastoid not yielding to other means within eight days. It must, of course, be understood that if head symptoms threaten, even a delay as long as this must not be allowed.

(2) Recurrent inflammations of the mastoid, which constantly reappear; when there exists a fistula or burrowing of pus the indication is strengthened.

(3) When the exterior of the mastoid is healthy, but there is evidence of retention of inflammatory products within the middle ear.

(4) In intense neuralgia of the mastoid. This affection is occasionally met with, and seems to be relatively frequently associated with sclerosis of the process, *i.e.*, filling up of the pneumatic spaces with bone. In these cases drainage is not aimed at, so that it is only necessary to remove a layer of bone, without endeavouring to reach the mastoid antrum.

(5) As a prophylactic operation, in order to establish drainage and facilitate cure in cases of incurable fœtid chronic suppurative otitis media, even when no evidence of retention exists. On surgical principles this indication is justifiable, but I cannot

help doubting its clinical expediency. In such cases, it is my practice to adopt only milder measures until symptoms of retention set in, which, be it remembered, are by no means a constant sequel.

Let us now turn to the method of operating. The instruments required are two gouges, of which the larger is considerably smaller than that usually employed for surgical purposes, a mallet, several pairs of artery forceps, a scalpel, a periosteum scraper, a sharp spoon of oval shape, ligatures, needles, and sutures, together with two blunt hooks. The parts should be thoroughly cleansed, and any hairs which are likely to interfere with the wound removed. An incision is then made a little behind the attachment of the auricle, and parallel to it, extending from a little below the centre of the mastoid to well above its base. The first cut should sever all the soft parts, including the periosteum. If sufficient space is not obtained in this way, a small incision may be made backwards from the highest point of the first wound. The periosteum is now scraped to either side, the bleeding stopped by ligature if necessary, and the soft parts held back by means of the hooks, which are entrusted to an assistant. In this way a satisfactory view is obtained of the cortex. If a fistulous opening be found, a probe must be introduced, and the orifice enlarged. If no opening be found, the gouge is applied to the bone just behind the meatus, and a layer of bone removed.

It is of the utmost importance that the highest point of the wound in the bone should be at a level not higher than the upper wall of the osseous meatus. It is, however, not always easy to define this limit, but the depression which lies below the spina supra meatum, already referred to, usually corresponds to the desired point. After the first wedge of bone has been removed, the operator must work in a direction inwards, but, at the same time, forward and slightly downwards; in this way the risk of wounding the lateral sinus is reduced to a minimum. It must, however, be remembered that persons are sometimes met with in whom the groove for the lateral sinus curves so far forward that practically no space exists for the operation in question. In most cases, after removing a few thin layers of bone, the pneumatic spaces are reached, and often pus begins to well up. It is then advisable to enlarge the orifice by removing bone from its lower and anterior margins. Afterwards the operation is continued by means of the sharp spoon, which is employed both as a probe and scoop. Any cheesy masses, granulations, or carious *debris* with which it comes in contact, are scraped away, and the instrument frequently can be made to force its way into the antrum. It must be remembered in employing the sharp spoon that no force must be used excepting in the direction of the antrum, *i.e.*, forwards and below the level of the upper wall of the meatus.

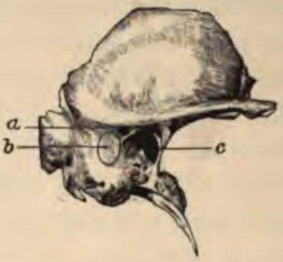

FIG. 34.—Temporal bone, showing (*a*) spina infra meatum ; (*b*) seat of wound in the bone ; (c) external meatus.

Occasionally, as we have seen, the mastoid process contains no pneumatic spaces excepting the antrum. Diploetic, or even ivory-like bone, may then have to be traversed, and the operator is confronted by a difficult task. In such cases it is advisable not to penetrate the bone to a depth greater than three-quarters of an inch, lest the labyrinth and facial nerve be wounded. Should the surgeon be so unfortunate as to wound the lateral sinus, plugging with lint soaked in carbolic oil should at once be resorted to. When the antrum has been opened into and cleaned out, a syringeful of boracic, carbolic, or corrosive lotion should be injected into the wound; as a rule the fluid will run freely out at the meatus immediately after the operation, bringing with it masses of cheesy pus. Sometimes on the following day, and for a day or two subsequently, this free communication becomes interrupted, to be re-established again afterwards. After the operation, sutures may be employed or not, as the operator considers best, and a large rubber drainage tube is inserted.

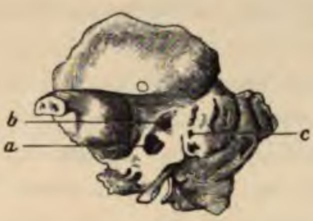

FIG. 35.—Temporal bone, with mastoid cells opened into, and posterior wall of meatus removed, showing (*a*) tympanum ; (*b*) mastoid antrum ; (*c*) mastoid cells.

It is commonly advised to dress the wound as in other head cases, but my own preference is for light dressings, which admit of being readily removed. Thorough irrigation of the wound and meatus with antiseptic solutions can then be employed several times daily from the beginning. The patient must, of course, be kept in bed for some time after the operation. Whenever it becomes difficult to introduce the drainage tube, this must be replaced by a lead plug, as suggested by Schwartze. A little ingenuity will enable the surgeon to have a suitable apparatus of this kind made; the essentials are that it should be a little shorter than the wound, and be supplied at its outer extremity by flat wings in order to prevent its too deep penetration. After the operation has been performed, it is well to keep the wound open until all fœtor and discharge from the middle ear have disappeared. Sometimes this occurs quickly, and granulations which have obstinately recurred before the operation rapidly disappear. Occasionally, on the other hand, the lead nail must be kept in for months and even years. Not unfrequently granulations at first appear about the wound, which may even require to be scraped away with a sharp spoon; but later the edges become hard, and these troublesome occurrences cease.

It occasionally happens that during such an operation as has been described a sequestrum is found within the mastoid; obviously this should be removed by enlarging the wound.

In young children the antrum is only covered by a delicate layer of bone and the operation is easy; indeed, in this class of cases a sinus usually exists. I have so far only referred to operating with a gouge. It must, however, be mentioned that some operators employ small trephines, while others use borers of different kinds. Barr and Macewen advise the employment of a dental burr which, according to these authors, can be guided with extreme accuracy. The objections to the employment of the mallet and chisel are, however, purely theoretical, and if I may be allowed to say so, lack that substratum of fact which underlies most theories.

As to the *prognosis* of this operation it is impossible to speak dogmatically, because it is undertaken under such different circumstances. The proceeding itself is not altogether devoid of danger, because the lateral sinus may be injured, notwithstanding the greatest care on the part of the surgeon; but even should this happen the patient may make a perfectly good recovery, as occurred in one of my cases. As a general rule, it may be stated that the danger of the operation is slight compared to the risks of deep-seated tension occurring in the course of chronic suppuration of the middle ear.

Other methods of securing drainage in cases of middle ear suppuration have been proposed. Thus Bezold at one time advocated more or less complete removal of the lower part of the mastoid process in cases where the pus had broken through towards the inner side of the tip, and gravitated into the tissues of the neck. It is now generally considered that opening and draining the abscess so produced, together with chiselling into the mastoid antrum, is a more satisfactory method of treatment.

Hessler has described cases in which the suppuration was confined to the mastoid cells when, according to this author, opening into the antrum is unnecessary. On general principles, however, the operation described is better even in such cases, for, on removing the outer layer of bone, the cells are usually freely exposed, and any purulent foci can thus be reached; while, if middle ear suppuration co-exists, as it almost invariably does, opening the antrum is valuable in aiding the cure of this condition.

In 1877 Carl Wolff recommended opening into the mastoid process by chiselling away the posterior wall of the osseous meatus. Küster has revived this operation, and extended it in so far that he carries the wound right into the tympanum which, together with the antrum, he scrapes out with a sharp spoon. Von Bergmann recommends very much the same operation, only he seems to remove also a portion of the upper wall of the meatus. These methods have only recently been practised by aurists, and a general verdict must be awaited. It has seemed to me that Schwartze's operation, combined with attention to the treatment of the middle ear by way of the meatus, is usually sufficient.

POSSIBLE FATAL RESULTS OF CHRONIC SUPPURATION.

As we have already seen patients may succumb in the course of caries or necrosis from marasmus due to exhaustion, a result comparatively frequent in young children. Again, the prolonged discharge may give rise to amyloid degeneration of the kidneys and other organs. Tuberculosis is stated by Von Tröltsch, Barr, and others, to be a possible result, although the connection is as difficult of absolute proof as it is probable on general grounds. Occasionally, too, fatal hæmorrhage may result from destruction of the walls of the internal carotid artery.

It is, however, with the *cerebral complications* due to ear disease that it is proposed now to deal. To avoid misunderstanding it is necessary to state that intracranial complications may arise in the course of acute middle ear inflammation, whether the process be simply catarrhal or suppurative. This is, however, unusual, and it is in chronic suppuration that the danger is greatest. It would be needless repetition to go over in detail the forms of this affection most prone to lead to head symptoms. It concerns us here only to discuss the diagnosis and treatment of the various forms of intracranial inflammation which may be encountered.

Inflammation may extend from the middle ear to the dura mater directly through disease of the bone, and this is probably by far the most frequent mode of origin. It must not, however, be forgotten that processes of fibrous tissue pass towards the tympanum through its roof, and through the hiatus subarcuata; again, vessels and nerves may carry the infective matter, while occasionally the extension occurs by way of the labyrinth.

The actual pathological conditions capable of being so produced are cerebral (or cerebellar) abscess, thrombosis of the lateral or other sinuses, and meningitis, usually suppurative. The relative frequency of these various complications is not easy to estimate, as statistics, even if carefully drawn up, are liable to give different results. Thus, in 1887, I collected 44 cases of fatal ear disease, of which 22 were due to either cerebral or cerebellar abscess, while in 12 the cause of death was meningitis, and in 10 thrombosis. In 3 cases classified as abscess there was, however, also diffuse meningitis, and in 5 thrombosis, while among the cases of diffuse meningitis there were

1 of abscess in the pons, and 1 of thrombosis in addition to the meningitis. Körner has collected 151 cases of fatal ear disease, and estimates the cases of abscess at 67, those of phlebitis at 61, and meningitis at 23. A careful examination of his tables, however, shows that many of the cases from which his statistics were compiled were really composite. Thus many of those classed as phlebitis seem to have been also cases of meningitis. It is necessary to bear in mind that numerous instances of fatal ear disease are really due to a combination of two, or even all three, conditions, to wit, abscess, meningitis, and sinus phlebitis; at the same time it is often possible, even in such cases, to distinguish the more, or most, prominent affection.

In discussing the extremely difficult question of *diagnosis* it will be first necessary to call attention to the fact that in cases of retention of inflammatory products within the ear, a number of cerebral symptoms may exist without being due to incurable changes within the cranium. Thus the patient may have vertigo, headache, rigors, fever up to 106°, photophobia, and even optic neuritis, and yet recovery may take place without operative interference. Allbutt, Wreden, and Kipp have reported cases which ended in recovery, and in which there was well-marked optic neuritis; from the present standpoint of our knowledge we must assume that in these cases a meningitis existed, and was cured. It must further be remembered that observations by Griesinger, Schwartze, and others have shown that sinus phlebitis may be recovered from.

The first difficulty which confronts us then is, when have we a right to assume that cerebral complications—irremediable, except by intercranial surgery—have set in?

When a case of chronic middle ear suppuration is about to go wrong there is almost invariably marked local pain. This is usually associated with fever, and there is often a history of diminished discharge from the meatus. On examining the ear any of the various conditions previously discussed may be found.

Even when it is stated that there has been no "running from the ear," there will always be found a little discharge, often dry and crusted, which is usually intensely fœtid. When the practitioner is confronted by this combination of symptoms the patient may be considered in danger of cerebral complications, and all the means already discussed, with a view to procuring free drainage, must be resorted to. In such cases it is of the greatest importance to resort to opening the mastoid antrum if other means have failed, and that rather too soon than too late.

As I have said, when the case begins to go wrong there is generally some febrile movement, although, as we shall see, when a cerebral abscess has actually been called into existence, both pulse and temperature may be subnormal. All pain occurring in the course of chronic middle ear suppuration is not necessarily due to retention of pus; it may be neuralgic or hysterical. I have met with both forms and they complicate diagnosis and prognosis considerably. Neuralgic pain is usually due to a bad tooth, and the seat of most intense suffering is just inwards from the tragus while the pain radiates towards the temporal region, but is not usually felt behind the ear. In hysterical patients—who are the victims of chronic middle ear suppuration, and who know its dangers—imaginary aches are often referred to the part. In one of my patients in whom I had been on the point of opening the mastoid some time previously, and was only prevented from doing so by the marked relief which followed the spontaneous extrusion of cholesteatomatous masses, pain in the ear occurred. When I was summoned the mastoid region was extremely sensitive, but the temperature was normal. Thinking the suffering might be hysterical I placed one hand in the region over the left ovary and pressed firmly, the other hand was then applied to the mastoid, the patient's attention being concentrated on the ovarian region, and firm pressure was perfectly tolerated. In such cases there is not usually the intense fœtor which characterises the small quantity of discharge generally found in the meatus in cases of retention of inflammatory products in the middle ear. When all has been said, however, it must be admitted that the differentiation between neuralgia complicating middle ear suppuration and pain due to deep-seated tension is extremely difficult. A consideration of the general and local symptoms, together with a careful examination of the ear, to ascertain whether the condition of parts is such as to favour retention of pus, and enquiry as to whether there have previously been similar attacks relieved by a flow of matter, will afford material aid in solving the question.

We have seen that local pain in the ear is a nearly constant symptom of threatened intracranial complications. Should these become a reality, more or less marked headache is added to the other symptoms. Sometimes it is confined to one side, sometimes the pain is diffused over the whole head. Cerebral vomiting may occur and intolerance of light is a common phenomenon. Gradually the patient passes into a condition of stupor, which finally terminates in coma. Active delirium is rare in my experience. In all these fatal cases a period arrives which, to the experienced physician, indicates that the disease, if allowed to run its course, will most certainly terminate fatally. A deepening of the stupor, a loss of reaction to stimuli, and heavy breathing are some of the characteristic signs that the end is drawing near. Let us now consider in how far we can differentiate the three conditions which may cause death.

Phlebitis of the Cerebral Sinuses.—The presence of this condition can often be diagnosed with tolerable certainty. The affection is associated with marked recurrent rigors, sweating, and great irregularity of the temperature. The thermometer should be used every hour in cases where this condition is suspected. In a typical case the fluctuations will be from 98° to 104°, or more. The thrombus in these cases is usually septic, and by its breaking down may give rise to a disseminated patchy pneumonia; less commonly metastatic suppuration occurs in the joints, liver, spleen, and kidneys.

In cases of ear disease, the lateral sinus is the vessel usually involved, and the affection is then commonly preceded by, and associated with, symptoms of mastoid tension; therefore, the œdema in this region, upon which much stress is laid by some authors, is of no diagnostic value. The clot—or if not the clot, the inflammation—is, however, prone to spread downwards along the jugular, with the result that the neck, corresponding to the course of the vein, becomes tender and even corded. I have never, so far, seen the paralysis of the pneumogastric, glosso-pharyngeal, and spinal accessory nerves described by Beck. Ballance, in diagnosing this condition, relies upon the following data:—(1) A history of discharge from the ear; (2) sudden onset of the disease; (3) extreme and rapid oscillation of temperature; (4) repetition of rigors and vomiting; (5) optic neuritis, and other cerebal symptoms; (6) tenderness and swelling in the mastoid region, with stiffness of the neck. As we have seen, thrombosis usually affects the lateral sinus, but occasionally the cavernous, and even the superior longitudinal, sinuses become implicated. Œdema around the eye, with protrusion of the eye-ball and defective vision, are symptoms which point to implication of the cavernous sinus; occasionally, also, paresis of the third, sixth, and fifth nerves are present.

Until very recently, thrombosis of the lateral sinus was looked upon as a *noli me tangere*, and treated by quinine, stimulation, and nourishing diet. In this respect we owe a marked advance to the brilliant operations of Arbuthnot Lane and Ballance. Both of these surgeons recommend exposing the septic thrombus, removing it with any dead bone which may be present, and inserting a drainage tube. At the same time the jugular vein is divided between two ligatures, and the septic cavity may then be washed out by injections into its distal end. It should be remembered that the mastoid antrum may be opened and drained at the same time, if, indeed, this has not been previously done. I have said that Lane and Ballance recommend this operation, and on good grounds. The former, so far as I know, has operated only on one case, and that with the result of saving the patient's life; while Ballance rescued two out of four cases, and one of his two fatal results was due to an intercurrent laryngeal affection.

Meningitis.—The meningitis which follows otitis is usually suppurative. The patient complains of pain, often radiating over the whole head; there is fever, sometimes cerebral vomiting may occur, while photophobia and general hyperæsthesia are often present in the earlier stages. At a later stage, delirium, spasm of the extremities, and even hemiplegia may occur. So far as I have seen, however, the patient usually goes gradually and quietly from bad to worse, and dies either from exhaustion or coma. It must be borne in mind that suppurative meningitis is very commonly associated with phlebitis of the lateral sinus, so that the clinical picture is commonly a complicated one. I do not think that it is always, or even frequently, possible to differentiate suppurative meningitis from cerebral abscess—a point which will be again touched upon. We must remember, too, that tubercular meningitis occurring in the course of chronic middle ear suppuration may also be met with.

Cerebral and Cerebellar Abscess.—Cerebral abscesses, due to ear disease, have, with few exceptions, been found in the temporal lobe of the affected side. Both cerebral and cerebellar abscess are most common on the right side, and, according to the statistics of Körner, the former are almost twice as frequent as the latter (32 : 64). Occasionally (6 per cent.) an abscess is present in both situations. In most cases, the collection of pus is either in direct contact with or quite close to the diseased bone which usually originates it. Sometimes a localised accumulation of matter exists between the dura mater and bone. In very exceptional cases, a considerable depth of healthy brain substance separates the diseased tympanum from the collection of pus.

We have already seen that it is practically impossible in many cases to differentiate intracranial abscess from meningitis. Occasionally, however, sufficient grounds exist for suspecting that the collection of matter is localised. Thus, if there is, or has been at any time in the progress of the case, an abnormally low pulse associated with a relatively high temperature, or if both pulse and temperature be subnormal, while the general symptoms would lead the observer to suspect the presence of fever, these combinations should make the surgeon incline to the diagnosis of abscess.

Otitic abscess of the temporal lobe only rarely gives rise to definite symptoms. Körner shows that in 8 per cent. of cases more or less interference with speech was met with; in 6 per cent. there was hemiplegia or hemiparesis (in two of these facial paralysis of the opposite side occurred). The same authority points out that photophobia was only noted in 4 per cent. of cases, of which three were instances of *cerebellar abscess.* If this observation be correct, the presence or absence of this symptom, which commonly exists in meningitis, might prove useful in differentiating between diffuse and localised intracranial suppuration.

Spontaneous pain seems unreliable, but localised pain or percussion is important both in estimating the presence and position of an abscess. Paralysis of the third nerve has been observed twice at least, if not oftener. In one patient, who was afterwards operated on by Mr. Caird, I found that there was deafness of the opposite ear, which became extremely marked, and which had certainly not existed before, as I learned from the relatives of the patient.

The points then which must be carefully inquired into and looked for in a suspected case of intracranial abscess are—(1) the pulse and temperature; (2) tenderness on percussion over any area; (3) the presence or absence of aphasia, amnesic or ataxic; (4) the condition of the muscles of the face and arm on the opposite side, and the ocular muscles of the same side; (5)

the hearing of the opposite ear; (6) whether or not the patient has had photophobia.

As a rule, unfortunately, many of these points give negative results, so that the observer is driven to rely for his *diagnosis* chiefly on the pulse, temperature, tenderness on percussion, and the exclusion of pyæmia. The next difficulty which arises is whether—an intracranial abscess being admitted—the collection of pus is in the cerebrum or cerebellum.

It has been thought that the presence or absence of vertigo might be of value in deciding between these conditions, but Körner indicates that the symptom is equally frequent in both conditions. Toynbee laid down rules as to the relation between inflammation of certain portions of the ear and brain disease, but, as I have shown elsewhere, his conclusions were not all justified by his statistics; but these seemed to show that affections of the mastoid cells (*i.e.*, with inflammation of the mastoid process) were more prone to produce abscess of the cerebellum or phlebitis of the lateral sinus, while, when the tympanum was affected without evidence of tension in the mastoid process, the cerebrum suffered most frequently. To a limited extent it has seemed to me that the tuning-fork test may be utilised in doubtful cases if the patient be sufficiently intelligent to admit of its application; thus, if bone conduction be absent or diminished, we are entitled to suspect implication of the labyrinth. Körner's and my own statistics have shown that cerebellar abscesses result more commonly than cerebral, from the extension of the suppurative process to the labyrinth. All, therefore, that can be deduced from the condition of the ear is that if the labyrinth be affected, or if there be external evidences of mastoid inflammation (pointing to backward tension), these facts increase the probability of cerebellar abscess. The localisation of pain in the occipital region is spoken of by Schwartze as constant in cerebellar abscess, but this symptom may be absent, and it has also been noted in suppuration of the temporal lobe

Tenderness on percussion is, however, of more value, and when marked in either situation should receive the attention its importance warrants; so far, according to Körner, it has only been observed in cases of abscess involving the temporal lobe. It need hardly be said that when any localisation symptoms are present, pointing to the cerebrum as the affected part, valuable aid in differentiation is thus supplied.

After all has been written that can be advanced on this subject, the fact remains that the surgeon must often remain in the dark on two crucial points—(1) Whether there be a localised collection of pus; (2) whether this be situated in the temporal lobe or cerebellum, for the few otitic abscesses which have occurred in other situations may be left out of count. Occasionally, also, a collection of pus may exist between the dura mater and bone. The only instances I have seen—operated on by Mr. Miller and Prof. Annandale respectively—seemed to be merely abscesses resulting from phlebitis of the lateral sinus.

Let us now turn to a brief consideration of the *treatment* in cerebral and cerebellar abscess. This is a subject which belongs properly to the domain of the general surgeon, but also requires notice in a work of otology. When the surgeon has convinced himself of the probability, or, in the event of the patient being moribund, even of the possibility of a localised collection of pus in the temporal lobe, operative interference should be undertaken. Quite a number of successful operations have now been recorded, all of them, however, in cases of abscess of the temporal lobe. In the first two successful operations published by the German surgeons, Schondorff and Schede, there appear to have been fistulæ to guide the operators. Then followed a case by Barker, which is the first in which there was no pre-existing canal to aid the surgeon; afterwards came successful operations by Caird, Macewen, Horsley, Cathcart, and Von Bergmann. The last authority in his recent work on intracranial surgery gives the following guides to the situation of the temporal lobe. About 5 centimetres over the zygoma there can be felt a distinct ridge, which represents the level of the upper margin of the required area. The posterior boundary is found by drawing an imaginary line from the margin of the orbit to the occipital tuberosity, and then drawing another at right angles to it through the posterior margin of the mastoid process; having thus found the posterior boundary the anterior is obtained by drawing parallel to it a line through the inferior maxillary articulation, while the lower margin of the trephine should, according to Bergmann, be at least one centimetre over the external meatus. Most of the successful cases have been operated on by placing the trephine above and behind the meatus in this area, but in Caird's case the extreme anterior part was chosen. After the disc of bone has been removed the dura mater may be bulged markedly into the wound, and from the records of operators does not, in most cases, seem to exhibit pulsation; the dura is then incised, and an exploratory puncture made into the brain substance, either with a knife or large aspirator. It is of great importance to employ an instrument of considerable calibre in this exploration, as the pus is sometimes very thick. Indeed, in one case operated upon by Mr. Caird at my suggestion, the abscess cavity was opened, but owing to the consistence of the pus, drainage was not obtained, as we found on *post mortem* examination. It has not been my desire to encroach upon the domain of the general surgeon by giving details of the methods of operating, but I cannot refrain from mentioning that strict antiseptic precautions are of the utmost importance, and as an initial step the parts near the proposed wound must be thoroughly shaved and washed in the first place.

Whether this area described by Von Bergmann, and so successfully utilised by the various surgeons mentioned, is, under all circumstances, the best, I have ventured to doubt. The spot which appears to me to be best adapted for an exploratory opening is situated at a lower level, just above and in front of the osseous meatus. By removing a portion of the temporal bone from this region the surgeon is brought very close to the roof of the tympanum. Now, when it is considered that most abscesses are quite near this point, and usually in contact with it, the conclusion is warranted that this operation is safer than a proceeding which requires the perforation of healthy brain substance. Information can at the same time be gained as to the state of the temporal bone. The chief objection to this method is that it requires the auricle to be dissected downwards, and thus, even if an abscess be found, the external ear is so situated as to interfere with dressing and drainage.

Abscesses of the cerebellum have been but rarely attacked with success. Indeed, so far the only successful example is a case of Macewen's, as yet unpublished. Hulke, however, in 1886 opened a cerebellar abscess "two centimetres behind and inwards from the mastoid process, the crown of the trephine encroaching on the inferior curved line."

Considering the uncertainty of diagnosis in many cases of intracranial abscess, it is, I think, the duty of the surgeon to postpone operative interference until it is obvious that recovery cannot take place without active intervention. Whenever this certainty has been arrived at, exploratory opening of the intracranial cavity is justified as being the only hope, even if the diagnosis be uncertain.

CHAPTER X.

CHRONIC NON-SUPPURATIVE INFLAMMATION OF THE MIDDLE EAR.

It is extremely difficult in the present position of otology to give a satisfactory account of this very complex subject. I have chosen the name "chronic non-suppurative inflammation," because it has seemed to me the general term best adapted to cover a number of conditions. It must be distinctly remembered, in considering the subject under the following subdivisions, that the various pathological conditions described may be present in the same patient.

EUSTACHIAN OBSTRUCTION.

It is very rare to find complete obliteration of the lumen of the Eustachian tube at any part of its course. In exceptional instances this condition is met with as a result of ulceration, injury, or the presence of tumours pressing upon the canal. Partial occlusion may also occur in the various forms of naso-pharyngeal growths which have been described in a previous part of this work.

Catarrhal conditions are, however, the most common cause of diminished calibre of the Eustachian tube. Although not uncommonly met with in adults, yet children are the chief sufferers from this very frequent and often troublesome affection, which usually involves both ears. Such patients often have large tonsils, and very commonly are the victims of adenoid vegetations. Both conditions tend to make the child liable to repeated exacerbations of naso-pharyngeal catarrh. In the case of adenoid vegetations, too, there is, as I have been able to observe by means of rhinoscopy, often direct pressure on the posterior and upper wall of the ostium tubæ, as it projects into the lumen of the naso-pharynx.

The usual course of a case of chronic Eustachian obstruction is somewhat as follows:—

A child is at first considered to be absent-minded or inattentive. Gradually the attention of the parents is awakened to the fact that the patient is in reality not acute in hearing, and marked exacerbations are noticed during a cold in the head. Meanwhile there are often marked symptoms of adenoid vegetations, frequently combined with enlarged tonsils. Children very rarely complain of tinnitus, but occasionally this phenomenon is present.

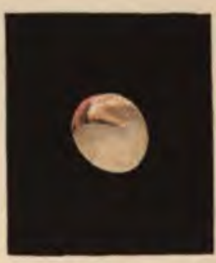

FIG. 36.—Indrawing of the membrane due to Eustachian obstruction.

Examination of the ear shows the tympanic membrane to be markedly indrawn. Those parts which are not fixed are sucked inwards, owing to absorption of the air within the tympanum, and there results a very characteristic picture. The short process remains prominent, but the membrana flaccida is retracted. The handle of the malleus, and with it the corresponding portion of the drum membrane, is drawn inwards, often lying in contact with the inner wall. As a result of these changes the short process stands out, supporting two well-marked folds.

Children who suffer from Eustachian obstruction are liable to exacerbations with each repeated cold, and not uncommonly each of these exacerbations takes the form of acute middle ear catarrh. If the patient be examined during such an attack very marked congestion is also seen, and perforation frequently follows. In yet another class of cases the tympanic complication is not of sufficient severity to give rise to pain, but very marked increase of deafness reveals its presence. Such additional impairment of hearing may be simply due to increased swelling of the lining membrane of the tube; but occasionally it is caused by the presence of mucous exudation within the tympanum. The membrane is then seen to be bulged and to be of an opaque greyish-white, relieved by a few radiating vessels coursing over its surface.

I have so far assumed that the patient is a child, and usually it is so. The same conditions are, however, occasionally met with in adults.

Having tested the hearing power of the patient the surgeon proceeds to employ the air douche by Politzer's method, or one of its modifications—unless, of course, an acute exacerbation be present, in which case he must be guided by the rules already laid down.[1] Even if there be free mucus within the tympanum this manœuvre instantaneously improves the hearing power; if the Eustachian tube only be affected the hearing becomes, after the first inflation, almost normal. While air is passing a moist sound may be heard as the current passes through the secretion. If instead of Politzer's method (or, of course, one of its substitutes), the catheter be used, the observer may be enabled to detect whether the râles occur only in the tube, or whether there is a slight moist sound just preceding the impact of the air upon the membrane.

Examination of the nares, anterior and posterior, should never be omitted in such cases. As a rule there will be more or less engorgement of the former, but this will commonly be found to depend upon the condition of the naso-pharynx. In every case of chronic or recurrent Eustachian obstruction, a careful exploration should be made with a view to detecting the presence of adenoid vegetations.

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[1] *See* Acute Inflammation.

The *prognosis* in simple catarrhal cases is always favourable, provided suitable treatment be adopted. The greater the improvement after inflation, and the longer its duration, the better is the prognosis. Where obstruction of the tube is due to ulceration, tumours, and the like, prognosis must depend upon whether or not the cause can be removed.

The *treatment* of obstruction of the Eustachian tube must vary according to its cause. Obviously, if the tube be obliterated or occluded by ulceration, relief will be difficult, if not impossible, to attain. In catarrhal cases it is important to treat the naso-pharyngeal condition which originates the swelling of the Eustachian orifice. The most common cause will be found to be adenoid hypertrophy, sometimes not sufficient to cause nasal obstruction. When this is detected it should be treated on the lines already laid down; this subject will, however, be again referred to.

It is perfectly true that cases, even where adenoid hypertrophy exists, recover their hearing for a time without operative interference, but such a cure is always temporary. If active measures be refused, then alkaline and astringent nasal washes should be employed. If the patient be first seen during a subacute exacerbation, it is well to abstain from attacking the nasal affection, except by mild measures, until the reaction has subsided.

Next in importance to curing the cause, we must consider treatment directed to removing the deafness. It is true that, in a certain number of cases, recovery of hearing will result simply from removing adenoid vegetations, but even when this has been accomplished, local treatment is still often required. Besides, there are certain cases where the cause is simply naso-pharyngeal catarrh, and in which this shows itself most obstinate; there are others where the cause can be directly demonstrated, as some gross lesion of the nasal passages (usually adenoids), but where operative measures are not countenanced. The principal indication is the employment of either Politzer's method, or the Eustachian catheter, according to circumstances. It is very uncommon to meet with a case where air cannot be introduced into the middle ear by one or other of these methods. Should this difficulty arise, a celluloid bougie may be passed in the manner already described. Mendoza and Cumberbatch have recommended electrolysis applied to the interior of the Eustachian tube, by means of an electrode introduced through the catheter, but I have never met with a case in which such treatment would be likely to be of service.

The question next arises as to how often such injections of air should be repeated, and how long they should be continued.

It is well to repeat the inflation daily for a fortnight, and then gradually to increase the interval, for it is commonly found that, after this time, the improvement produced is maintained for two, three, or even more days. It is impossible to be dogmatic on this point, for occasionally cases are met with in which a single inflation effects a cure, while in others several weeks of daily application of compressed air are required. In cases requiring prolonged use of the air douche, it should be prescribed to be employed every day for a month, and this must be followed by a month's remission. If some such precaution be not taken, the drum membranes become relaxed, as shown by undue bulging outwards after the injection of air.

Where deafness is associated with bulging of the membrane, and the presence of an opaque colour relieved by radiating vessels—signs indicative of mucous accumulation within the tympanum—massage from above downwards applied behind the ear will form a useful adjunct to treatment by inflation. These are really examples of subacute tympanic catarrh, secondary to the Eustachian obstruction, and it was in this class of cases that the late Mr. Hinton advised free incision of the membrane, followed by injections of alkaline solutions through the tube.

The milder measures just indicated will, however, usually—if not always—prove effectual; more particularly if the nasal passages receive due attention.

In very obstinate cases of Eustachian obstruction, some authorities advise the employment of laminaria bougies; I have not found this method of treatment necessary, and Hinton recorded a case where one of these instruments broke within the canal, but was fortunately extruded after a time. Injections of astringent solutions are also sometimes employed through the Eustachian catheter, while Rau advised passing, after the manner of a bougie, a piece of cat-gut which had been dipped in strong solution of nitrate of silver, with a view to acting directly upon the lining membrane of the tube. As Schwartze points out, however, this proceeding may be the cause of acute middle ear inflammation, and should, therefore, be avoided.

SEROUS CATARRH OF THE MIDDLE EAR.

This condition may be associated with Eustachian obstruction, and may even be directly due to it (hydrops ex vacuo). I have met with one case where serous exudation seemed to be caused by the administration of iodide of potassium. The most common cause, however, is a cold in the head, which may be quite slight, but leaves the patient more or less deaf, sometimes in one, sometimes in both ears. In my experience the affection is more common in adults than in children. The pathology of this affection is simply a catarrh of the lining membrane of the middle ear, associated with a serous yellow exudation.

It is perhaps open to question whether this form of catarrh should be described as chronic, because probably the exudation occurs rapidly. As a rule, however, there are no acute symptoms such as pain and fever; and, besides, the aurist is usually consulted after the deafness has lasted for some time. Tinnitus and vertigo are rarely, if ever, complained of, but the patient often has the sensation of a "drop of water in the ear;" and, if of an observant disposition, he may have noticed that his hearing power changes suddenly with a movement of the head.

On inspecting the tympanic membrane different appearances may be met with, all of them more or less characteristic, but often by no means pathognomonic. The membrane may be indrawn owing to coincident obstruction of the Eustachian tube; not uncommonly the sharply defined folds are seen in the upper part, but yet to the trained eye the lower part is relatively bulged outwards. In recent cases the drum membrane has a glistening moist appearance which is highly suggestive of the presence of fluid.

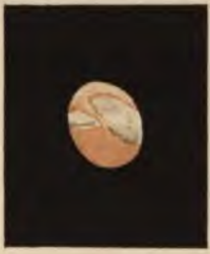

FIG. 37.—Serous catarrh of the middle ear (left).

The only really pathognomonic appearance is the presence of a yellow tinge extending from below upwards. On careful examination this yellow coloration may be seen to be bounded either in front or behind the malleus (sometimes in both situations) by a dark line. This line is straight or curved, and looks not unlike a hair lying on the membrane. Sometimes this characteristic appearance is only to be detected after the air douche has been used. After inflation, if the fluid be of syrup-like consistence, bubbles of air may become entangled in it, and appear as small circular dark patches behind the membrane. Occasionally an injection of air drives the drum membrane outwards so that marked bulging is visible; this appearance is usually most marked in the posterior segment, where a distinct bladder-like body may make its appearance; not uncommonly these projections have also a characteristic yellow tinge.

When, from the appearance of the membrane and the history of the case, an accumulation of fluid is suspected, it is well to employ the catheter, so that auscultation may be called in to aid the diagnosis. In the case of children this may be impossible, and then Holt's modification of Politzer's method should be employed. On auscultation, while air is driven through the Eustachian tube, a faint moist sound is often heard just as the air enters the tympanum; much practice is, however, required to appreciate this phenomenon. Occasionally the middle ear is so filled with exudation that no air can be made to enter.

After inflation the appearance of the drum membrane may change in the manner already indicated. If the presence of a line has been noted before the air douche, it is most important to observe whether its position has changed; for obviously if the appearance depended upon a mobile liquid behind the membrane such a change must, in all probability, occur, while if due to some peculiarity in the membrane it would remain *in situ*.

Immediately after the air douche the hearing is greatly improved, but this improvement commonly disappears within a few hours, while in simple cases of Eustachian obstruction the benefit derived from inflation is commonly maintained for a day or more.

The diagnosis then depends upon—(1) The appearance of the membrane; (2) the history of deafness occurring rapidly after a cold, and sometimes associated with the feeling of fluid moving in the ear; (3) the results of auscultation; (4) the rapid disappearance of the improvement resulting from the air douche in a case, the history of which does not point to deafness of sufficiently long standing to make fibroid changes probable.

The *prognosis* is usually favourable. For a time a tendency to recurrence may be present, but eventually, so far as my experience goes, the cases all do well.

The *treatment* is comparatively simple. If any nasal catarrh be present it must receive attention. Occasionally, although rarely, nasal polypi give rise to serous middle ear inflammation; they should, of course, both for this and other reasons, be removed. Very often, however, the nasal catarrh which caused the affection has already disappeared when the patient comes under observation.

In order to remove the fluid accumulation various methods have been employed. Some cases do well under simple treatment by inflation, as in Eustachian obstruction. Injections of air are, as pointed out by Politzer, more efficacious if performed with the head forward and bent to the opposite side, a position which temporarily converts the anterior wall of the tympanum into the floor, and thus permits the fluid to drain towards the pharynx.

Injections of air alone are, however, usually insufficient, especially if there be any considerable quantity of fluid in the middle ear. Before resorting to incision, I now always employ massage with lanolin from above downwards behind the ear, as suggested by Ludewig. Not uncommonly I have seen exudation, which would certainly have required operative treatment for its removal without massage, disappear under its influence.

If, after a week of massage and inflation, no improvement occurs, the tympanic membrane must be incised. This operation, if carefully performed, and if due caution be exercised as to after-treatment is, in my experience, quite innocuous and by no means very painful. As I consider attention to details of great importance, if it be desired to avoid complications, I shall describe the *modus operandi* at length.

In the majority of patients no anæsthesia of any kind is required. In view of the importance of keeping all extraneous liquids from the wound I do not even employ cocain. The middle ear is first inflated in order to drive the membrane as far as possible from the inner wall. A speculum, carefully cleansed in carbolic lotion, is now introduced, while the operator directs light upon the parts by means of a forehead mirror. A Gruber's paracentesis knife is then carefully washed in carbolic solution, and as carefully dried. The patient is told to keep as steady as possible; but the head should not be held, so that if any movement takes place, it may be away from rather than towards the knife. In the case of children, however, the arms should be controlled, lest the operator's hand be grasped or pushed by the patient. The knife is now introduced, and an incision made into the posterior and inferior quadrant from above downwards.

The opening should correspond in length to about a quarter of the diameter of the membrane in this situation. This operation requires for its accomplishment considerable dexterity. The beginner is liable to under estimate the distance, and may either miss the membrane entirely or merely inflict a superficial scratch. Indeed, the latter mistake may also be committed by the experienced operator in his desire to avoid injuring the inner wall of the tympanum. If the position indicated be chosen for incision, the only harm likely to result from wounding the mucous membrane is hæmorrhage into the middle ear which is usually soon absorbed; at the same time, it must be remembered that it is most desirable to avoid any additional source of irritation, and therefore the surgeon must do his best to introduce the knife through the membrane, and, at the same time, stop its point short of the inner wall. In two cases, reported respectively from the cliniques of Schwartze and Trautmann, a copious venous hæmorrhage occurred after paracentesis. Fortunately the result was in neither instance fatal, although the bleeding was ascribed to a puncture of the jugular bulb, which was supposed to project into the floor of the tympanum owing to a congenital defect in the temporal bone.

Whenever the small incision has been made, a drop of yellow serum commonly appears. If, now, air be driven through the Eustachian tube, more fluid is driven into the meatus, where it must be carefully mopped up with absorbent cotton wool. Occasionally the secretion is more like syrup in consistence, and then difficulty may be experienced in driving it out. Some authorities advise the employment of alkaline injections (soda solutions) through the catheter; but it is safer, if possible, to procure evacuation by the air douche, aided, if necessary, by enlarging the incision and exhaustion of air in the meatus. When the tympanum has been emptied, the hearing power commonly undergoes very marked improvement, in spite of the presence of the artificial perforation. Afterwards it is desirable to guard against too early closure of the wound, and to avoid inflammatory reaction. As an incision in the membrane tends to heal with extreme rapidity, it is always desirable to make the patient use Politzer's inflation every four or six hours, while he mops out the serum, which is thus evacuated, by means of absorbent cotton wool. In order to avoid inflammation, the meatus must be kept plugged, and the patient should put himself on a low diet for twenty-four hours, and be advised to avoid both alcohol and tobacco. It is better, too, to take precautions against exposure and cold, although the operation is one which can safely be done at an out-patient department.

Occasionally the fluid tends to re-accumulate, and to obviate this it is well in every case to continue Politzer's inflation and massage for a time. In some instances, however, two and sometimes three incisions are required before the serous exudation ceases to form.

I believe that inflammation will rarely result from paracentesis of the membrane, if only the operation be performed with due attention to the directions just given.

FIBROID CHANGES IN THE MIDDLE EAR WITHOUT PRECEDING SUPPURATION.

I propose to embrace, under this heading, those pathological processes which are described by authors as chronic middle ear catarrh, and to include also the class of cases described as sclerosis (von Tröltsch), otitis media hypertrophica (Gruber), and proliferous catarrh (Roosa).

Let us first glance at the pathology of these cases. In those which are manifestly catarrhal, the first stage is, no doubt, usually associated with obstruction of the Eustachian tubes; this may, however, pass off, and when the patient comes into the hands of the aurist all evidence of its existence may have disappeared. Swelling of the lining membrane of the tympanum, including the inner layer of the membrane and the covering of the ossicles, with more or less secretion, is soon followed by the development of fibrous tissue in various situations. This may lead to thickening of the drum membrane, interference with the mobility of the ossicles, and adhesions of various kinds.

In the non-catarrhal form changes of a very similar character occur, but not uncommonly the tympanic membrane remains normal in appearance, and the process is frequently localised in the region of the stapes, which becomes immobile or impeded in its movements, owing to fibroid or even calcareous changes in its immediate neighbourhood.

Let us now consider, in a general way, the *semeiology*. Deafness is, of course, a characteristic symptom; tinnitus aurium is very commonly met with, and this is sometimes so distressing that the sufferer would gladly bear the loss of hearing if only he could be relieved of the subjective noises, and it is no uncommon thing to find persons convinced that the tinnitus is the sole cause of deafness. Vertigo is a by no means unusual symptom, and is probably due, like tinnitus, to increased tension within the labyrinth. Sudden exacerbations of both phenomena may arise from time to time. Occasionally this denotes a threatened secondary process in the internal ear; but it must be remembered that if the stapes be fixed, and the membrane of the fenestra rotunda be unyielding, changes of blood pressure may also account for sudden increase of both giddiness and tinnitus. Neuralgic pains about the head, as pointed out by Legal and Schwartze, may be due to chronic catarrhal affections of the middle ear.

Besides deafness and tinnitus, another anomaly of hearing is very common, viz., paracusis Willisii, or hearing better in a noisy place, such as a railway carriage, cab, or factory. Occasionally, but more rarely, loud sounds are extremely painful, and, curiously enough, this symptom is most common in those who are very deaf (hyperæsthesia acoustica). Double hearing is also an occasional symptom (diplacusis).

A feeling of tension in the head is a frequent phenomenon; the patient, indeed, feels as if the brain were too large for the skull, and this sensation may be so aggravated that the sufferer is unable to fix his attention for purposes of intellectual effort.

The first step in the investigation of this, as of other forms of ear disease, should be to test the hearing power. It will generally be found that, even although only one ear is complained of, both are affected. Fibroid changes in the middle ear are more commonly met with in adults, who have already passed early youth, but children are by no means exempt.

We shall now pass to the general rules of *diagnosis*, which apply in all cases, reserving for future consideration any reference to etiology.

Inspection of the ear may, or may not, give any decided result.

In comparatively recent cases, evidences of Eustachian obstruction are often met with, but the picture is by no means always so characteristic as that described in the preceding section. Thus the membrane may be only indrawn in its anterior portion, causing undue prominence of the anterior border of the malleus; or it may be that the posterior segment is sucked inwards, resting upon the long process of the incus, which may be distinctly seen. When obstruction of the Eustachian tube has lasted for a long time, the membrane may become atrophied, as shown by the greater transparency of the degenerated portions if large, and their darker colour if small. These dark atrophic patches are like cicatrices in appearance, but they lack the sharp definition characteristic of scars. In the case of large transparent patches, the air douche is generally followed by their projection into the meatus, where they appear as bladder-like bodies. In old, neglected cases of Eustachian obstruction, the drum membrane often becomes thickened, while the lower part of the malleus may be adherent to the inner wall of the tympanum. This condition can be diagnosed by the fact that the membrane cannot be drawn outwards at the adherent spot by means of Siegle's speculum, nor is it affected by the air douche.

Various degrees of thickening of the membrane may, however, occur without any evidence of Eustachian obstruction. The thickened areas show themselves as opaque patches, sometimes crescentic in shape. Occasionally chalky deposits are also met with, and the formation of such concretions has actually been proved to occur independently of suppuration; but notwithstanding this, the presence of chalky patches usually indicates that suppuration has occurred at some time. Calcareous deposits may exist in persons of quite normal hearing power, and the same may be said of localised opacities. Sometimes, however, the whole membrane is so markedly thickened that perfect hearing would be manifestly impossible. At the same time no aurist, however skilled, can diagnose even approximately the amount of impairment from objective examination alone.

Quite commonly a membrane is met with which the most experienced observer would consider perfectly normal. Frequently, however, a close examination will show that it has certain traits not usually present in health. One of these frequently to be observed is an abnormally distinct definition of the malleus. Von Tröltsch also observes that this bone sometimes shows a nodular outline, as if due to inflammatory thickening. I have ceased to attach importance to this appearance, because it may be present in the ears of those whose hearing is perfect. A delicate flamingo red shade, most distinct in the posterior segment of the membrane, is often met with, as pointed out by Schwartze. I consider this a very important feature when present, as I have never known it associated with normal hearing.

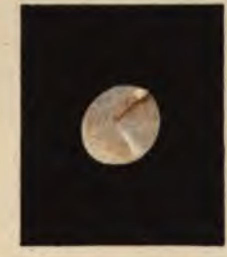

FIG. 38.—Thickening of the membrane.

The reader may now legitimately expect to be enlightened as to the method of *diagnosis* to be employed in such cases as are associated with a normal tympanic membrane. This is, unfortunately, the crux of modern otology. We have seen that the tuning-fork test is not by any means reliable, yet this, and the employment of high and low tones, are the only means at our command for differentiating the class of cases under consideration from chronic lesions of the labyrinth. Indeed, it is more than likely that a certain number of those affections which have been referred to the middle ear are in reality labyrinthine. The clinical method at present in vogue is to consider such cases as show increased hearing by bone conduction, when tested by Rinne's and Weber's experiments, to be chiefly dependent upon middle ear changes. Roosa also lays great stress upon paracusis Willisii (hearing better in a noise) as a symptom of middle ear—as opposed to labyrinthine disease. Again, some authors trust much to deafness for high notes as indicating involvement of the perceptive apparatus (labyrinth), and difficulty in hearing low notes as symptomatic of a lesion in the tympanum.

The employment of the air douche, preferably by means of the catheter, is a most useful aid to diagnosis, indispensable in arriving at a prognosis, and our sheet anchor in treatment. While air is being driven through the Eustachian catheter certain auscultatory phenomena occur, which afford much assistance in arriving at a conclusion with regard to the pathological condition. Thus, if the air passes with a moist sound, this indicates the presence of catarrhal exudation in the Eustachian tube, and it will be no unreasonable assumption to suspect that a similar state of hypersecretion exists within the tympanum. The air may pass with difficulty through the canal, and perhaps it is only heard to impinge upon the membrane if the air bag be emptied during deglutition; at the same time there is no moist sound, but occasionally a distinct tendency to whistling is detected. When these phenomena occur there is every probability that the lumen of the tube is narrowed by an old-standing chronic process, which has resulted in the interstitial deposit of fibrous tissue. The chain of reasoning by which this conclusion is arrived at depends upon the well-known clinical fact that a recent catarrhal inflammation of mucous membrane is associated with hypersecretion. In yet another class of cases the air enters freely—more freely than in the normal subject—and, as it strikes the membrane, produces a clearly defined pure sound, which indicates that the canal is patent. In some cases the narrowing of the tube is so marked that it is difficult to introduce air into the tympanum, and then both for diagnostic and therapeutic purposes it may be desirable to use a celluloid bougie in the manner indicated in a previous chapter.

After the catheter has been employed it is of great importance to note carefully whether any improvement has followed its use. Testing the hearing power immediately before and after is, therefore, essential. The patient should further be asked whether the injection of air has favourably affected the tinnitus, or whether the ear "feels lighter."

The diagnosis and prognosis depend largely upon the data so obtained, as will be evident from a consideration of the possible factors of deafness which may be met with, and the effect likely to be produced upon them by the air douche.

These factors are as follows:—

Obstruction of the Eustachian tube, leading to altered tension of the intratympanic structures.—Manifestly so much of the deafness as is due to this cause alone will be relieved by the introduction of air into the tympanum, and the improvement so produced will last for from 6–12 hours at least. Occasionally the improvement is not manifested immediately, because for a few seconds the outward tension of the compressed air is excessive. If this state of matters exists, the patient should be directed to swallow with the nostrils closed, and this will be followed by improvement.

Diminished tension of the membrane due to atrophy.—If the membrane be unduly relaxed its tension will for the moment be restored, while the atrophied part is supported by the column of air behind it. An improvement which only lasts for a few minutes may thus result from the air douche.

Swelling of the mucosa and clogging of the ossicles due to this cause, and to the presence of free exudation.—Under these circumstances the sudden impact of air will scatter the secretion and partially mobilise the ossicles. The improvement so produced will last an appreciable time—probably for some hours at least.

Fibrous or calcareous deposits in various parts.—The effect of compressed air, will, in the presence of those pathological conditions depend upon the exact nature and position of such deposits. Thus if the stapes be fixed through fibrous or even true anchylosis, the result will be purely negative. If the stapes and fenestra rotunda be unaffected, but the membrane rigid, the force of the air current will expend itself upon the labyrinth and may thus produce temporarily increased deafness and tinnitus. On the other hand, if the adhesions be favourably situated, they may be either stretched or ruptured by the air douche, in which case more or less improvement will result. Such improvement may be permanent in case of rupture, but is usually only temporary and due to stretching.

I have discussed this subject thus in detail because its comprehension places us in a position to put very concisely the whole matter of diagnosis—so far as it affects the welfare of the patient — and prognosis. The greater then the improvement after the air douche, and the longer its duration the better is the prospect of improvement, and *vice versa.* Before giving an absolutely unfavourable prognosis, however, it is often well to repeat the catheterisation several times. Hearing better in a noise is a symptom which is of unfavourable significance. Tinnitus is usually present in some degree, but is often intermittent. Should it be constant, this fact must unfavourably influence the prognosis. It is of great importance to elicit from the history of the patient whether the deafness be stationary or increasing, as fibroid processes seem often to come to a standstill of their own accord, and when this is the case energetic treatment may even be harmful. Complete deafness is comparatively rare, and depends upon secondary complications of the labyrinth. Occasionally sudden exacerbations of tinnitus and deafness associated with vertigo occur and indicate labyrinthine mischief.

The *treatment* of these cases is conducted on the same lines by most authorities, and up to a certain point I am at one with them; but I propose also to discuss separately the special forms of treatment which seemed to be required in different clinical types. In all cases, however, it is desirable to secure permeability of the Eustachian tube if constricted. For this purpose the catheter or Politzer's method is employed, assisted, if necessary, by means of bougies. The air douche in some form is also desirable where no Eustachian obstruction exists, but where its employment is followed by distinct improvement which lasts for an appreciable time. The length of time during which this treatment should be employed varies in different cases. As a general rule it may be ordered to be continued for a month, and then intermitted. My own practice in these cases is to see the patient, and pass the catheter (and a bougie if necessary) as often as is required, to enable his relatives to open the Eustachian tubes, by Politzer's method, and having instructed them in the method, to examine the ears again after the lapse of a month, during which time the ears are inflated daily. As a rule, any intelligent person can learn how to use the air bag, and most patients can tell whether the inflation has been successful. In some persons, however, fibroid changes of the middle ear seem to produce, or to be associated with, diminished sensibility of the parts, and such patients may find it difficult, if not impossible, to tell whether an inflation has been successful. In these instances—but not otherwise—the aural surgeon may require to undertake the injections of air himself.

Continental authorities employ also suction applied to the meatus by means of some such instrument as the rarefacteur of Delstanche. I cannot see how exhaustion of the external air can act more beneficially than compression from within, and such experiments as I have made with this method have confirmed my scepticism.

Lucæ has suggested intermittent pressure applied to the malleus by means of a probe. This method has seemed to me only to produce temporary benefit in the few cases where any result is obtained. Hommel advises intermittent pressure upon the tragus with the finger, repeated with great rapidity.

The rapid compression and exhaustion of the air within the meatus is supposed to mobilise the drum membrane and chain of ossicles. This method has not, however, justified the expectations of its originator.

Injections of a few drops of various solutions through the Eustachian catheter are much employed, especially on the Continent. The solutions chiefly used contain iodide of potassium, bicarbonate of sodium, or chloride of ammonium (gr. 10 ad. ℥i). Caustic potash in greater dilution, and chloral hydrate (5–15 grs. ad. ℥i.), as suggested by Lucæ, are also used.

The only rational theory which could justify this form of treatment is that these substances set up a slight amount of inflammatory reaction, and thus stimulate the absorbents to activity. As a matter of actual experience, little if any permanent benefit results from these injections beyond what may be ascribed to the catheterism, which is a necessary accompaniment. I have recently been trying massage behind the ear in this class of cases, but cannot as yet record any successful results; indeed, such could only be expected where the process is comparatively recent, and the fibroid changes but slightly advanced.

In all forms, dry air and high altitude seem often to exercise a beneficial effect both upon the hearing power and tinnitus. It is an unfortunate fact, however, that the improvement lasts only during the stay of the patient in an Alpine resort, and disappears with his return to ordinary surroundings.

Tinnitus and vertigo, occurring in the course of this affection, if they do not yield to local treatment, must be treated on the rules already laid down in a previous chapter.

Before concluding these remarks on general treatment, it may be well to mention that Weber Liel, and after him Woakes, have asserted that a number of cases of the affection we have been considering are principally due to deficient ventilation of the tympanic cavity, caused by insufficient action of the muscles of the Eustachian tube, more especially of the tensor palati. These authors have, therefore, advocated the intratubal application of electricity, but the correctness of their views have not been supported either by logic or clinical facts.

TYPES OF CHRONIC NON-SUPPURATIVE INFLAMMATION.

So far I have not discussed etiology, as it has seemed well to attempt a sub-division of the subject, using the cause and clinical features of each form as a basis of classification. It must, however, be remembered that very frequently mixed types are met with. It must be further premised that the general remarks on treatment apply to all forms, and in the following pages only the special modification required will be alluded to.

Catarrhal.—In this class of cases there is generally a very distinct history of deafness and tinnitus being increased by catching cold. Occasionally this tendency seems to begin after an attack of typhoid fever or other illness. Even an increase of moisture in the atmosphere affects the symptoms for the worse. Occasionally there is a history which points to antecedent attacks of Eustachian obstruction, and sometimes to repeated subacute inflammations of the middle ear. The tympanic membrane is usually very distinctly thickened. Sometimes patches of atrophy are present, a result which probably depends upon long-continued Eustachian obstruction and the pressure of the atmosphere on the outer surface resulting therefrom; or the membrane and malleus may be adherent to the inner wall of the tympanum.

Some more or less marked change in the naso-pharynx will generally be found.

The *prognosis* depends upon the rules which have already been given; but relatively it is more favourable in this class of cases than in any of the other types.

The *treatment* must be directed to relieving the naso-pharyngeal catarrh which is commonly the *fons et origo* of the aural malady. Any gross changes detected must receive attention. If these parts be simply in a condition of chronic catarrh, the employment of Godfrey's chloride of ammonium inhaler will often meet every indication. The chloride of ammonium vapour is also, in my experience, the best treatment for the middle ear. I generally advise the patient to use it for five minutes at bed-time during a month, and to force the fumes into the tympana by Valsalva's method from time to time. The supposed astringent action of turpentine, and oil of pine, has sometimes been taken advantage of in the treatment of catarrhal cases. This may be done by drawing up the volatile vapour from a half-full bottle into a Politzer's bag, which is then used in the ordinary way. Another method of employing such volatile substances is to introduce a few drops into the bag, where time is allowed for evaporation. When moist sounds are heard on catheterisation, a few drops of a (5 gr. ad. ℥i.) solution of sulphate of zinc may also be injected into the Eustachian tube.

It is in catarrhal cases that climate is of the greatest consequence. A high altitude and dry air are the most desirable conditions, while moist atmosphere is harmful. The seaside, as Moure points out, seems to exercise a harmful effect on catarrhal deafness. Such hygienic and dietetic precautions as have been recommended in cases of catarrh of the nose and pharynx are equally important in the aural complications they give rise to. Wet feet are especially to be avoided, while a general line of tonic and bracing treatment is indicated.

Hereditary Form.—In this class of cases there is usually a definite family history of deafness. It is a somewhat curious fact that in certain families, otherwise healthy, there seems to be a tendency to rigidity of the ossicles. I have a strong impression that in many such instances the patients really owe their aural malady to the arthritic diathesis. Inherited deafness of this kind not uncommonly begins comparatively early in life, and often progresses from bad to worse. Frequently it is associated with the catarrhal variety just described, and it is, therefore, difficult to give distinctive features other than the history.

As a rule, however, the tympanic membrane is not so distinctly altered as in the catarrhal variety—especially as to position; and it may be either quite normal, or show the flamingo red colour already described.

The *prognosis* of this form is usually bad. If there be evidence of middle ear catarrh the treatment should be conducted on the lines just sketched. If, however, the naso-pharynx be normal, if colds do not make the patient hear worse, and if the tympanic membrane be not materially altered, iodine is indicated generally and locally. The iodide of potassium may be given internally, while iodised fumes are inflated by Valsalva's method. A very useful prescription is equal parts of tincture of iodine and acetic ether, of which thirty drops are mixed with a pint of hot water; the steam is then employed for the purpose. A bottle containing solid iodine may also be heated, and the fumes drawn into a Politzer's bag, whence they are driven into the middle ear. In this class of cases the iodide of ethyl, as recommended by Burckhardt-Merian, Politzer, and Urban Pritchard, may prove serviceable. A few drops are put into the air bag, and allowed to volatilise, after which the vapour is injected into the middle ear. The employment of pilocarpine has been advocated both for injections into the tympanum (5 drops of a 2 per cent. solution), and subcutaneously ($\frac{1}{6}$ gr. or more). The first method has been employed, with occasional improvement, by Politzer, while the second was suggested by Kosegarten.

Rheumatic Cases.—With a view to determining the relation between chronic fibroid changes in the middle ear and rheumatism, I at one time investigated all my private cases in this direction. It soon became evident, however, that only in those cases which were directly traceable to a rheumatic attack, could any distinct connection be proved.

In such instances the membrane is either normal, or presents the characteristic flamingo tint.

The *prognosis* is uncertain. In one of my patients very rapid improvement resulted from the employment of iodised vapour locally, and iodide of potassium internally, although the results of examination pointed strongly towards anchylosis of the stapes. The treatment is the same as that described in the hereditary form, *i.e.*, iodide and iodised steam or vapour; salicylates, however, must, if possible, be avoided. In both this and the hereditary form it is conceivable that some benefit might be derived from the waters of Wiesbaden, Bath, or one of the other spas so serviceable in rheumatic affections.

The Neurotic.—The cases which come under this category are usually more or less sharply defined. The onset of deafness is traced to such causes as bilious attacks, neuralgia, or child birth—in a word, to causes which might easily account for weakness of the auditory nerve, but between which and fibroid changes in the middle ear it is difficult to trace any connecting link. Further, the hearing and tinnitus become suddenly worse as the patient enters a hot room, or even on excitement. The injection of air into the middle ear often makes hearing worse for a time, and increases the subjective noises. The same effect is produced in a very marked degree by bodily fatigue or mental worry. On the whole it is very doubtful whether a large proportion of these cases are not really caused by chronic changes in the labyrinth; it is, however, customary to consider them as due to anchylosis of the stapes.

The tympanic membrane is often quite normal, and the Eustachian tubes freely pervious, while the naso-pharynx is healthy, but of course evidences of catarrhal changes may be met with, and occasionally the two types are mixed.

The *prognosis* is not favourable; if the ear symptoms have followed pregnancy a repetition of the cause is likely to be followed by increased deafness.

Nerve tonics, such as iron, arsenic, and strychnine, are indicated, more especially the first two, as the patients are usually anæmic, and all over-exertion must be avoided. During an exacerbation of deafness the interrupted current sometimes gives relief, while occasionally the constant current succeeds in allaying for a time the tinnitus. If the air douche makes the hearing worse for an appreciable period after its application, it should on no account be used again; on the other hand, the inflation of iodised vapour by Valsalva's method is sometimes useful.

Syphilitic.—In the case of children with hereditary syphilis the course run by what appears to be at first a simple Eustachian catarrh is often by no means favourable. Instead of rapidly progressing towards a cure these cases are absolutely uninfluenced by treatment. The tympanic membranes remain thickened and indrawn, while very considerable, and sometimes total deafness persists. The tuning fork, too, is not heard, or only faintly perceived by bone conduction. Knapp considers this combination of symptoms to be due to a mixed affection of the middle ear and labyrinth.

In acquired syphilis I have frequently observed the following combination of symptoms. At a variable period after infection the patient becomes rapidly deaf, either with or without vertigo. There is no pain, but tinnitus is often present. The immediate cause is often said to be some incident, which it is difficult to connect with the sudden occurrence of a middle ear lesion, such as sea-bathing (noted in several of my cases). The affection is usually unilateral, and the tuning-fork is heard markedly better through the bones of the head by the deaf ear. The Eustachian tubes may or may not be pervious, but inflation produces neither moist sounds nor improvement in hearing. The rapid onset in these cases has made me strongly suspect that not the middle ear, but the cochlea, is primarily at fault; however, the drum membrane usually seems to be thickened and less mobile than normal, so that the condition is not incompatible with syphilitic periostitis involving the tympanic structures, except in so far as it is entirely painless. In both the forms of syphilitic deafness described, iodides and mercury may be employed, but rarely is any result thus attained. More is probably to be expected from subcutaneous injections of pilocarpine, as recommended in labyrinthine disease; I have not, however, had any opportunity of trying it in this class of case, although I have seen excellent results from it in syphilitic disease of the labyrinth with impaired bone conduction.

OPERATIVE TREATMENT OF CHANGES RESULTING FROM CHRONIC NON-SUPPURATIVE INFLAMMATION.

Anomalies of Tension in the Membrane.—As we have seen, the membrane may be atrophied to such a degree that it is thrown out like a bladder towards the meatus on inflation. According to Gruber, increased tension occasionally acts as a cause of impaired hearing. This author has suggested the following experiment as a means of detecting anomalies of tension. During Valsalva's experiment, a tuning-fork is by the normal ear heard worse by air conduction and better by bone conduction than before or after. This depends upon the increased intra-tympanic tension acting unfavourably on the functions of the sound-conducting apparatus. If the membrane be already excessively tense, no alteration will occur during Valsalva's experiment, or, at most, if the membrane be capable of yet further tension, the ear will react as in the normal subject, but to a less degree. If the membrane has been previously unduly relaxed, Valsalva's experiment will, according to Gruber, restore its tension, and the vibrating fork will, so long as inflation is continued, be heard better by air and worse by bone conduction than before or after. This observation is interesting, but, from a practical point of view, I question whether much is gained, even if we admit that the data and deductions are incontrovertible.

In excessive tension Gruber recommends multiple incision of the membrane; while, in cases of relaxation, Politzer advises the same procedure. I do not think we shall err greatly in considering both alike useless. In extreme relaxation it is important to prevent repeated inflations by Valsalva's method, and occasionally temporary benefit is derived from the application of collodion to the atrophied part, as suggested by M'Keown.

Incision of Posterior Fold.—Incision of the posterior fold of the membrane was first suggested by Lucæ. It is only applicable in cases where, owing to indrawing, this fold is particularly prominent. The operation is very easily performed, by nicking the projection from above downwards with a Gruber's paracentesis knife. The object of the incision is to relieve the tension; so far as my experience goes, the tinnitus is sometimes temporarily relieved, but the hearing is not usually improved by this operation.

Section of the Anterior Ligament of the Malleus.—This operation consists in cutting through the anterior fold, and then introducing a probe-pointed knife, with its concave cutting margin directed upwards, and pressing it in this direction. Section of the anterior ligament was introduced by Politzer; but I am not aware that any definite statistics exist bearing upon its merits.

Section of the Tensor Tympani.—This operation has already been referred to and described in discussing removal of the tympanic membrane and malleus in chronic suppuration.

Weber Liel first suggested and carried it out in cases of fibroid changes within the tympanum. Gruber is still in favour of its employment in certain cases, but so far as I am aware, he stands almost alone among acknowledged authorities. He seems to consider it advisable, in cases of indrawn membrane, where the air douche is followed by momentary improvement in hearing; but even his championship of Weber Liel's operation is lukewarm.

At some future date, this proceeding may become justifiable in cases of chronic non-suppurative inflammation; but at present we possess no trustworthy data to show that it has any definite therapeutic value whatever.

Attempts to establish a Permanent Perforation—Excision of the Membrane and Malleus—Mobilisation of the Stapes.—In certain cases where the stapes is still mobile, while the membrane, malleus, and incus are rigid, a perforation will manifestly admit sound waves directly to the stirrup bone. In cases of absolute closure of the Eustachian tubes from ulceration, and in certain instances of severe tinnitus and vertigo, benefit may also accrue from the presence of a perforation.

Strangely enough, however, the aurist has never been able to imitate nature, and although perforations due to disease often refuse to heal, an orifice made in an imperforate membrane will almost certainly close in spite of every effort. It matters not if a piece be excised or burned away by means of the electric cautery, and an eyelet (Politzer) or tube (Voltolini) be subsequently inserted, for closure is sure to occur.

For this reason, recent authorities have advised the excision of the membrane and malleus. Even then, however, it is prone to be replaced by cicatricial tissue. To prevent this, Kessel has suggested the removal of the tendinous ring, by means of which the drum membrane is attached to the bone, and even chiselling away a portion of this bone along the posterior circumference.

The method of performing the operation has already been referred to. In America, Sexton and Burnett have performed excision of the membrane and malleus with good results. Lucæ, however, after a very extensive experience, having performed the operation fifty-five times, has arrived at the conclusion that the results are usually so unsatisfactory that it will be well to put aside this method of treatment until indications for the operation can be more accurately established.

Mobilisation of the stapes is an operation which was first introduced by Kessel. It has not been extensively practised in Germany, but has recently received much attention from French authorities, *e.g.*, Boucheron, Gellé, and Miot. The last-named author has supplied the best contribution to the literature of this subject with which I am acquainted. Miot gives not only a very careful account of the methods employed by himself and others, but describes the actual results he obtained in a number of cases, an appreciable amount of improvement having occurred in seventy-four out of one hundred and twenty-six cases operated upon. It must, however, be remembered that, in a certain number of these, the operation was undertaken to relieve the effects of chronic suppuration.

Miot's method is to expose the stapes, either by excision of the posterior and upper part of the membrane or by destroying it in this situation with the electric cautery. Methodic mobilisation of the exposed stapes is then carried out by means of a probe or a specially adapted instrument. Miot's indications for and against mobilisation of the stapes are, unfortunately, extremely difficult to understand, and it must be at present considered an open question whether the operation will justify for itself a permanent place in the therapeutics of ear disease.

Severing Adhesions.—Adhesions of the tympanic membrane to the inner wall may be severed by means of an instrument not unlike a miniature iridectomy knife, as suggested by Prout. Opinions as to the benefits to be derived from this operation vary, and our methods of diagnosis will require great advances to be made before we are in a position to lay down definite indications.

I have thus endeavoured to lay before my readers a critical digest of the operative methods which have been suggested, and to keep my individual opinion in the background. For my own part, I do not perform these operations in this class of cases—excepting section of the posterior fold—because, with this single exception, there seems to be an element of risk in all of them. The tendency of modern otologists—more particularly of the German school, who have in this respect been followed to some extent by American, French, and Italian authorities—is too much towards operations which are, at best, purely experimental. It would be no unfair criticism to state that, on perusing a chapter on this matter in any of the larger German works, the idea remains with the reader that otologists have vied one with another to cut out ever-increasing portions of the tympanic structures, that their reasons for so doing are not always sound, and that most credit is acquired by him who has succeeded in extracting most. It is true that the published cases are often said to be successful, and that we do not read of inflammatory reactions; but it is this very absence of inflammation in the recorded cases that makes one fear that, beyond those which have seen the light of day, there may be other instances of experimental operating which have been followed by less satisfactory results.

THE CONNECTION BETWEEN DISEASES OF THE THROAT AND NOSE AND MIDDLE EAR AFFECTIONS.

Diseases of the throat and nose have been already discussed at length, and referred to in connection with middle ear disease. I do not, however, think that the mere statement as it occurs in many works, that pathological conditions of the nose and throat must receive attention, is sufficient.

It has generally been the implied teaching of modern otology that any obstructive nasal disease is liable to cause obstruction of the Eustachian tube, or exhaustion of air within the tympanum. Now this is, to a certain extent, true; but, if carried through its logical termination to energetic operative procedures in all cases, is likely to end in discrediting otology. Thus, I can imagine nothing more absurd than the statement attributed to an American rhinologist, that he cured disease of the internal ear by operating on the nose. Whether he was misrepresented or misrepresenting, I do not know. I merely mention the instance to show what lengths have been reached in some quarters, and to justify the space devoted to this matter. Let us now consider the effect of different nasal and pharyngeal affections on ear disease.

Adenoid Vegetations.—In every case of catarrh of the middle ear, and in most cases of chronic suppuration, it is extremely desirable to remove adenoid vegetations when present. It is important to remember that there need not necessarily be sufficient tissue to obstruct nasal respiration, and it is therefore well always to examine the naso-pharynx, especially when the patients are children or young persons.

Catarrh and Other Affections of the Naso-Pharynx.—These conditions, too, should receive prompt treatment, especially in non-suppurative catarrh of the middle ear.

Affections of the Anterior Nares.—It is generally assumed that any obstructive lesion of the nostrils is prone to cause catarrh of the Eustachian tube and middle ear. This is true to only a very limited extent. It must have astonished those who hold by the generally accepted opinion, how seldom marked deafness co-exists with nasal polypi. I am well aware that slight catarrh of the Eustachian tubes is by no means uncommon, but it seems rarely to pass beyond the stage of hypersecretion. The removal of nasal polypi is, however, always indicated on general grounds, and I have merely chosen this example to show that the danger to the ear from obstruction of the anterior nares has, as I think, been over-estimated. A certain amount of hypertrophic catarrh is quite commonly met with in otherwise healthy persons. If there be, in a patient who suffers from ear disease, sufficient hypertrophy to cause interference with speech and respiration, active treatment is demanded on general grounds, and for the comfort of the patient. If, on the other hand, the nasal symptoms be slight, let the operator hold his hand and rather use mild remedies, such as sprays, inhalations, and injections, combined with appropriate treatment directed to the ear. What has been stated as to hypertrophic catarrh, applies equally to deviations of, and projections from, the septum.

I have laid some emphasis upon this point, because it would appear that some aural surgeons and rhinologists are under the impression that fibroid changes in the middle ear can be dissipated by operating on the nasal passages.

Affections of the Pharynx.—Large tonsils are often associated with adenoid vegetations, and of the two there can be no doubt that the latter are more dangerous to the integrity of the middle ear. Hypertrophied tonsils act, however, as foci of inflammation, and so tend to keep up catarrh of the pharynx and naso-pharynx. Besides, by preventing free play of the palate, they probably interfere with the action of the muscles which open the Eustachian tubes. Excision of the enlarged glands is therefore often advisable.

Granular pharyngitis, if associated with symptoms, may be treated by the electric cautery. If, however, we find a few granules or slight hypertrophy of the lateral folds without any symptoms, it by no means follows that the ear condition will be benefited by active treatment. In such cases pigments, vapours, and gargles, are indicated rather than the electric cautery. To illustrate my meaning I may quote the case of one of my patients who suffered from anchylosis of the ossicles, and who had some granules in his pharynx. He spent some weeks in London having these granules, which caused no symptoms, cauterised, and again came to see me, neither better nor worse as regarded his hearing. I have also known a patient have the uvula amputated for supposed catarrhal deafness.

My object then is to impress upon the reader that operative interference must not be undertaken haphazard, and in conclusion I would lay down the following rules:—

(1) Let adenoid vegetations be treated in all cases of middle ear disease. The same is true of naso-pharyngeal catarrh.

(2) In affections of the anterior nares and pharynx let operative treatment only be employed if it is indicated on rhinological and laryngological grounds—apart from the aural condition. It is quite probable that very marked obstruction

of the anterior nares may cause catarrh of the naso-pharynx and Eustachian tubes, but in this case the obstruction will be so marked as to warrant interference for other reasons.

(3) In the case of septic discharge from the nasal cavities, let the parts be carefully cleansed before employing Politzer's bag, otherwise suppuration of the middle ear may result.

NEUROSES OF THE MIDDLE EAR.

Neuralgia.—Otalgia may be due to any of the causes to which neuralgia generally has been ascribed, but it is most frequently caused by caries of the teeth—commonly of the lower, but occasionally of the upper jaw. It is noteworthy that in these cases the patients often have no pain in the tooth. The most tender spot is usually described as being inwards from the region of the tragus; from here the pain radiates over the temporal region. Shooting pain in the ear is not uncommon in malignant disease of the throat, in acute inflammations of the pharynx, and in tuberculosis of the larynx. These cases must be treated on general principles. The removal of the offending tooth is, of course, required when dental irritation is found to be the cause. Palliative or curative treatment directed to the throat may be required, while in the few cases which are not recognisably reflex, quinine, iodide of potassium, iron, arsenic, galvanism, *et hoc genus omne*, will be called into requisition.

Neuroses of Motion.—(*a*) Spasm of the tensor tympani and stapedius have been described. The former can be diagnosed when it gives rise to visible movements of the tympanic membrane, while the latter was suspected to be the cause of tinnitus in a case observed by Gottstein, where blepharospasm was associated with tinnitus. In both forms the chief symptom is recurrent tinnitus of a deep humming character.

(*b*) Spasm of the palate muscles as a cause of tinnitus has already been referred to (*see* Pharynx).

CHAPTER XI.

THE AUDITORY NERVE AND LABYRINTH.

It is no part of my intention to discuss in detail the physiology of the internal ear and auditory nerve. A few general remarks may, however, serve to recall the main facts, as they concern us from a purely clinical point of view.

It is at present generally assumed by physiologists that the cochlea is chiefly or only concerned with the act of hearing, while the semicircular canals have equilibration for their most important function. As to the physiology of the vestibule no satisfactory hypothesis has yet been framed.

As every student of physiology knows, the combined theory of Helmholtz and Hensen is that which is usually accepted as applying to the cochlea. The basilar membrane, upon which are supported the auditory cells, has been found to be narrowest at the base of the cochlea, and gradually to widen as the apex is reached, hence it was assumed that the lower parts perceived high notes, while the uppermost areas were apportioned to lower tones. This theory is so beautiful, and at the same time so well calculated to account for various phenomena, that it is accepted by most authorities. It was, however, strongly opposed by Voltolini, and more recently by Stepanow and Rutherford. As the matter at present stands the advocates of the Helmholtz, or musical theory, have but slender evidence to support their position.

Much importance is attached to a case recorded by Moos, in which there was deafness for high notes, and where *post mortem* examination revealed atrophy of the auditory nerve in the first turn of the cochlea. So far as I am aware, however, this is the only case which at all bears out the Helmholtz theory. Baginsky states that destruction of the upper parts of the cochlea causes deafness for tones of low pitch, while injury towards the base produces an opposite condition. In opposition to the results so obtained may be quoted the experiments of Stepanow, who, after destruction of the upper convolutions of the cochlea, found no gaps in hearing. Obviously, however, experiments on animals are not trustworthy evidence on this question. That a certain amount of hearing power may remain after partial exfoliation of the cochlea is rendered certain by clinical facts observed by Cassels, Christinneck, Lucæ, Burckhardt-Merian, Bezold, and Gruber. In the cases of Christinneck and Gruber a very considerable amount of hearing power remained. Thus Christinneck's patient, who was deaf in both ears, heard a tuning-fork (C), connected with a resonator from the forehead, louder on the ear (right) from which the cochlea had been exfoliated. In one of Gruber's patients (a boy of 14) the tuning-fork (A^3) was perceived not only by bone conduction but through the air. In the other the tuning-fork was not heard by air conduction, but perceived when placed on the zygomatic or mastoid region of the same side. By far the most important observation, however, is that of Stepanow. His patient suffered from chronic suppuration of the middle ear, and subsequent necrotic exfoliation of the upper part of the cochlea. It was found that the affected ear was capable of perceiving "every note within the limits of human audition." It is worthy of note that Stepanow, recognising the importance of the point, took precautions to carry out his experiments before reliable scientific witnesses. These facts, then, are sufficient to prove that those who dispute the Helmholtz theory have considerable evidence upon their side, and further, that the clinician will do well to refrain at present from attaching too much importance to theoretical deductions from what is at best only an unproved hypothesis.

As to the functions of the semicircular canals, authorities are fairly unanimous in considering them as peripheral organs of equilibration. It matters little from a clinical point of view whether we regard them as organs of the static sense, according to the views of Mach, Breuer, Brown, and Cyon, provided only we are acquainted with the main experimental results of physiologists. In this respect, probably little of clinical importance has been added to the now classical researches of Flourens, who demonstrated that section of a semicircular canal gave rise to movements of the head, and sometimes of the body, in the axis of the cut canal; at the same time, a corresponding rotation of the eyeball occurs, as was more particularly demonstrated by Cyon. This authority and Bechterew have also pointed out that injury of the auditory nerve causes forced movements towards the side operated upon.

It is extremely probable that the portion of the auditory nerve which supplies the ampullæ of the semicircular canals finally terminates in the cerebellum. This view has long been held, partly on anatomical grounds, partly because of changes observed in the cerebellum after destruction of the semicircular canals by Stefani and Weiss, and chiefly on account of the similarity between the symptoms produced by operations on the semicircular canals and cerebellum. The auditory nerve proper passes to the cortical centre "through the lower fillet of the opposite side, and thence by means of the posterior tubercle of the corpora quadrigemina and corpus geniculatum internum" (Ferrier).

The auditory centre, as shown by Ferrier and Yeo, is in the superior temporal convolution.

It is extremely difficult to give a classification resting upon any pathological basis, and this difficulty is generally admitted by every author. It remains, therefore, only to arrange the subject in such a manner as will best meet the requirements of the clinician.

The most suitable method has, therefore, seemed to be to divide the large group of material into two main classes, viz.:—

(1) Affections of the labyrinth or auditory nerve which make themselves gradually felt.

(2) Affections of the same parts manifesting themselves suddenly.

This classification causes some difficulty as to the introduction of certain conditions which, strictly speaking, do not come under either category, and, to prevent misunderstanding, it will be well to refer to them here. As has been already stated, defective development of the external ear and meatus may be associated with a similar condition of the deeper parts; congenital defects of the labyrinth may, however, exist without corresponding changes in the external parts. Complete absence of the labyrinth and auditory nerve, deficiency of certain parts, *e.g.*, the semicircular canals, vestibule, or portions of the cochlea, and a rudimentary condition or absence of the acoustic nucleus, have been described.

AFFECTIONS OF THE LABYRINTH OR AUDITORY NERVE WHICH MAKE THEMSELVES GRADUALLY FELT.

In chronic suppuration of the middle ear, as we have seen, the labyrinth may become invaded, and occasionally portions or the whole of the osseous capsule become exfoliated. Chronic non-suppurative inflammation of the tympanum is, however, the most common cause of gradually progressive disease of the labyrinth. As has been before stated, it seems extremely doubtful whether some of the affections which have been grouped under middle ear inflammation may not in reality be labyrinthine from the beginning.

In a case of progressive tympanic disease, it is somewhat difficult to adduce any definite *symptoms* which indicate involvement of the labyrinth. Vertigo, as we are aware, may be due to changes of tension in the sound-conducting apparatus which, through the fenestræ, react upon the perilymph. When, however, such attacks become more frequent, and when each recurrence is associated with additional deafness and tinnitus which does not disappear, and when, moreover, these phenomena are associated with diminished power of hearing the tuning-fork by bone conduction, this clinical combination points to a labyrinthine complication.

The *diagnosis* is further confirmed if inflation of air makes the hearing temporarily worse, and when, even after this transient exacerbation has disappeared, there is no improvement either in the tinnitus or deafness; if the patient hears worse in the midst of noise, or if high notes are heard relatively worse than those of low pitch.

In children who are the victims of inherited *syphilis*, a middle ear catarrh, which tends to involve the labyrinth, is by no means uncommon, as pointed out by Knapp. The marked deafness, unrelieved by treatment of the middle ear, and associated with loss of bone conduction, are the most prominent symptoms.

Certain drugs, more especially *quinine* and the *salicylates*, have a very marked influence upon the labyrinth or auditory nerve. After the employment of either in considerable quantity, tinnitus, deafness, and sometimes giddiness, with loss of bone conduction, result, both of which usually disappear completely. It is still uncertain what is the actual condition of parts which, in these cases, leads to impaired hearing. Roosa from experiments on the human subject, and Kirchner from dissections of rabbits fed on quinine, believe that the labyrinth is hyperæmic. In cases of quinine amblyopia, however, the retina has usually been found excessively pale, and it seems unlikely that this drug should have an opposite effect upon the labyrinth and disc. Although the deafness usually passes off, I have seen a number of cases in which the habitual use of quantities of quinine seemed to be the cause of chronic nerve deafness. As in these patients there was also a history of repeated malaria, it is not easy to assign to each possible factor its real value.

After an attack of *typhoid fever*, a more or less chronic labyrinthine deafness seems to be occasionally present, which may either pass off or get worse. In those cases which recover, there is probably merely a hyperæmia of the labyrinth, as described by Schwartze and Passavant, while persistent deafness may be due to small-celled infiltration, as pointed out by Moos.

It is not improbable, judging from the histories given by patients, that repeated *supraorbital neuralgia* and, perhaps, even *toothache* may lead to reflex deafness, probably due to changes in the auditory nerve.

Locomotor ataxia is stated by Erb to be occasionally associated with grey degeneration of the *portio mollis;* but this has not yet been definitely proved. That a chronic progressive deafness, often associated with diminished bone conduction, does come on in the course of this disease is, however, well known to clinical observers.

In *intracranial diseases* the auditory nerves or centres are occasionally involved, either directly or through interference with their circulation. Thus in *intracranial aneurisms*, Lebert points out that it is especially where the basilar artery is affected that disturbance of hearing, with marked tinnitus, is met with. Of intracranial *tumours*, it is chiefly those which involve the *cerebellum* and *pons* which are associated with disturbance of hearing. A very remarkable observation by Schwartze shows that a unilateral cerebellar tumour may cause bilateral deafness. Lesions of the *temporal lobes* may cause that curious condition known as word deafness, where the chief difficulty is comprehension of words, while sounds are perceived; on the other hand, as is well known, a lesion of the temporal lobe may cause simply deafness. In a remarkable case recorded by Wernicke and Friedländer, both temporal lobes were the seat of gummata, a condition which caused complete bilateral deafness.

Chronic changes in the meninges may also cause bilateral or unilateral deafness, by involving one or both auditory nerves. In *hæmorrhagic pachymeningitis*, Moos found effused blood within the labyrinth. The rapid or slow onset of the ear symptoms, due to gross changes within the cranial cavity, will depend not so much upon the nature of the primary affection as upon its course. Sometimes the deafness may follow an apoplectiform attack; sometimes it will develop gradually. Giddiness is usually marked, if the trunk of the auditory nerve or cerebellum be affected. Deafness, with impaired or lost bone conduction, associated with other symptoms due to the respective intracranial lesions mentioned, will be the marked features of such cases. When deafness, tinnitus, and vertigo are due to cerebral affections, and all other symptoms are absent, I do not think a correct diagnosis is possible.

Nerve deafness has also been ascribed to *affections of the stomach, uterus, and kidneys.* I suspect the explanation of this supposed connection lies in the fact that an already deaf individual will be more deaf when, from any cause,—be it illness or simply fatigue,—his system is below par. Many victims of chronic deafness find that, when over-tired, the hearing is worse. In other words, when a considerable portion of nerve energy has been used up, the auditory nerve becomes less able to conduct impressions. I suspect that this fluctuation of hearing power occurs in those whose auditory organs are perfect, but that it is not perceived by them as it would be by a patient whose hearing was already impaired.

In *advanced age* there is a tendency to diminished conduction on the part of the auditory nerve; but the pathology of senile nerve deafness is still uncertain. After fifty there is, in many persons, defective hearing by bone conduction, and often such individuals also hear the voice very much better than the watch.

In conclusion, it will be necessary to consider somewhat more in detail chronic labyrinthine deafness resulting from constant exposure to loud sounds. The most typical and best known is *boilermakers' deafness*, but other varieties occur. Thus repeated shooting, whether at game or at a target, is not uncommonly followed by more or less chronic deafness, with diminished bone conduction, affecting particularly the left ear. Artillerymen may suffer in the same way, and Blake has pointed out that the constant use of the telephone may be followed by impairment of hearing and tinnitus. Bürkner found that deafness for high tones was common among engine-drivers. Boilermakers are, however, by virtue of their occupation, specially exposed to noise, and therefore afford the most typical examples. Habermann has recently investigated this subject with great care, both clinically and pathologically. He found that in boilermakers' deafness bone conduction is impaired, and high notes are relatively badly heard, while tinnitus is present in 50 per cent. of cases—a combination giving a typical clinical picture of a labyrinthine affection. Habermann was enabled to examine microscopically the cochlea of a deaf man who had been a coppersmith, and was accidentally killed. There were destructive and atrophic changes throughout both cochleæ, but these were most marked at the base—the region of high tones according to the Helmholtz theory. It was at one time held by Roosa that boilermakers' deafness was due to changes in the middle ear—a position which he has since abandoned. There is, however, little doubt in my mind that chronic obstruction of the Eustachian tubes is a predisposing factor, a conclusion at which I have arrived both on theoretical grounds, and because in a majority of cases evidences of middle ear catarrh are found.

Diagnosis of Chronic Affections of the Labyrinth and Auditory Nerve.—The most important points have been already referred to in connection with each form of deafness, and it is very doubtful whether much more can be said to elucidate the matter. I need not recapitulate the difficulties which lie in the way of accepting the tuning-fork test and the results of examination with tones of different pitch, as yielding definite diagnostic indications. On the whole, I am inclined to accept the views of Roosa that the following combination of symptoms is strongly suggestive of disease of the labyrinth or auditory nerve :—

(1) Tuning-fork heard better through the air.
(2) Hearing power better in a quiet place.
(3) Conversation heard relatively better than the watch.
(4) Noise annoying to a marked degree.
(5) Inflation of the middle ear renders the hearing worse.

While deafness for high notes is strongly suggestive of disease of the labyrinth, it is very questionable how far "gaps in hearing," when they occur, are of diagnostic value. According to Urbantschitsch, this phenomenon may be met with both in deafness due to cerebral disease and in affections of the middle ear. Diplacusis, or double hearing of certain notes, is, as we have seen, more common in disease of the middle than of the internal ear.

Vertigo is not of great value in estimating the presence or absence of chronic affections of the nervous apparatus. As we have seen, it is not a feature of all forms, and is frequently due to changes in the middle ear.

Tinnitus is often present, and when it is described as of a high-pitched ringing character, this would, according to the observations of Brunner, rather indicate irritation of the auditory nerve as a whole; too much importance must not, however, be attached to this symptom.

Absolute deafness, when it occurs, is characteristic of involvement of the auditory nerve (including, under this term, the labyrinth and centre), while word deafness indicates a lesion of the temporal lobe.

The *prognosis* in chronic labyrinthine deafness is usually bad. In chronic suppuration of the tympanum, invasion of the labyrinth by pyogenic organisms means not only permanent marked, and sometimes absolute, deafness, but also danger to life, as extension is prone to occur through the internal ear to the intracranial structures.

In labyrinthine disease, secondary to chronic non-suppurative tympanic affections, the most that can usually be hoped for is that the hearing may not get worse—although even this result is always uncertain. The vertigo commonly disappears eventually, but the probable duration of this symptom can never be gauged in this class of case. In syphilitic patients there is more hope of improvement if pilocarpine be early resorted to.

Persistent deafness after quinine has not yet been studied sufficiently to enable an opinion as to prognosis to be expressed, and the same remark applies to labyrinthine lesions following typhoid.

Deafness due to changes in the brain and spinal cord is usually incurable; and the same is true of senile changes in the auditory nerve.

Labyrinthine disease, from constant exposure to loud sounds, will often remain stationary, or may even improve after removal of the cause.

The *treatment* of the class of diseases we have just considered will, in most cases, prove a thankless task.

In cases of gradual involvement of the labyrinth in the course of chronic suppuration of the middle ear, the affection must be treated on the lines already laid down. Threatened invasion of the internal ear might, under certain circumstances, form an additional reason for opening the mastoid, or for other measures calculated to ensure drainage.

In labyrinthine complications, occurring in the course of chronic non-suppurative tympanic disease, the latter should, if still amenable to treatment, be attended to. On the other hand, if inflation of the middle ear makes the hearing worse, and the tinnitus more marked, this line of action should be avoided. The paroxysms of vertigo may be treated by counter-irritation over the mastoid, leeching if there be any evidence of congestion of the tympanum, rest, and the internal administration of bromides. In these cases it is of great importance to attend to the general health, as any falling off in this respect is liable to be associated with exacerbation of the symptoms. Quinine and the salicylates should either be altogether avoided or, if this be impossible, their effects must be very carefully watched. I should also feel inclined to try subcutaneous injections of pilocarpine in this class of cases, but cannot yet speak definitely as to its action.

In syphilitic patients, mercury and iodides of potassium and iron are indicated on general grounds. The hypodermic injection of pilocarpine, employed daily for a fortnight, is, however, the only treatment from which there is even a prospect of success. The dose for a child should be from $\frac{1}{12}$ – $\frac{1}{8}$ of a grain.

Where there is a history of neuralgia the cause should be sought and, if possible, removed. Carious teeth must in these cases receive special attention.

Whether persistent deafness, due to quinine, tends towards recovery, I do not know; the administration of hydrobromic acid or ergotin may be tried in such cases.

In the chronic labyrinthine disease which results from typhoid, leeching over the mastoid may be employed.

Deafness due to central changes in the nervous system requires no special treatment beyond that applicable to the primary disease, while senile deafness is not amenable to treatment.

Deafness from continuous exposure to loud sounds should, if possible, be treated by removing the cause. If this be impracticable, it is advisable to make the patient pay particular attention to the Eustachian tube, and to supply him with the means and directions for inflating it if there be obstruction, before the ears are exposed to noise. The patient should also be directed to stop up the ears while engaged in the nocuous occupation.

Tinnitus is often a very marked and disagreeable symptom, and requires treatment, for the details of which I must refer the reader to Chapter II.

I have not yet referred to two methods of treatment which are much employed in all labyrinthine affections, viz., strychnine and electricity, because I have not sufficient confidence in either to recommend it. By those who have more faith, however, strychnine may be employed hypodermically, beginning with a dose of $\frac{1}{30}$ of a grain, which may, according to tolerance, be increased up to $\frac{1}{10}$, or even $\frac{1}{5}$. Weak solutions of this drug have also been used as injections through the Eustachian catheter, and occasionally an ointment containing a suitable dose is applied to an artificially produced raw surface behind the ear.

Electricity, in the form of the constant current, is sometimes employed in the treatment of tinnitus, and has already been referred to in a preceding chapter. In the same form it is also advocated in the treatment of deafness. The general opinion now held is, however, that neither the constant nor the interrupted current can effect a cure where there is organic disease of either the auditory nerve or labyrinth. There is one form of deafness in which I sometimes employ Faradic electricity, viz., in those cases where exacerbations of deafness occur, associated with causes which, while they cannot produce any change in the pathological condition of the auditory apparatus, cause increased deafness by diminishing nerve tone. In these cases the exacerbation of deafness is sometimes relieved by the passage of the interrupted current from ear to ear, care being taken not to cause giddiness.

CONDITIONS OF THE LABYRINTH, AUDITORY NERVE AND CENTRES, WHICH MAKE THEMSELVES SUDDENLY FELT.

This class of cases has some features in common which we shall consider before giving a brief detailed account of the pathological conditions and their special symptoms.

The characteristic phenomena met with are—(1) deafness, usually associated with tinnitus; (2) vertigo occurring in the majority of cases; (3) the history of the case indicates that these symptoms have come on quite suddenly.

The *deafness* may be unilateral or bilateral, and in typical cases is usually very marked, and often absolute. As we have already seen, high notes are often heard worse than those of low pitch in all forms of internal ear mischief. The tuning fork by bone conduction is heard either not at all or badly on the deaf or deafer ear, although I have met with very definitely marked exceptions to this rule. Weber's and Rinne's experiments should be employed in all cases where primary disease of the labyrinth is suspected; into these it will be unnecessary to enter further, as they have been already fully discussed.

Vertigo, associated with vomiting, is very commonly a marked feature, but is altogether absent in certain forms. The typical, and other forms of auditory vertigo, have already been discussed in detail in a previous chapter.

The history is of the utmost importance; indeed, now that considerable doubts have arisen as to the value of the tuning-fork test in doubtful cases, reliance must be placed mainly on the history. In a typical case the surgeon is told that the patient heard quite well, and was within a few hours attacked by marked deafness, tinnitus, and often vertigo, with subsequent vomiting. When this combination of symptoms is described the diagnosis is simple. It is, however, otherwise when the deafness is not very marked, or when there is a history of previous deafness, of which the attack seems to be but an exacerbation. The observer must then carefully weigh the evidence, with a view to determining whether the increased deafness has come on more rapidly than could be accounted for by changes within the tympanum. The tuning fork and testing the hearing power with notes of different pitch may materially aid diagnosis, although the results so obtained are not always trustworthy. The sudden occurrence of very marked typical auditory vertigo can only be ascribed to organic changes within the labyrinth when disease of the meatus and tympanum can be excluded.

The exclusion of middle ear disease as a cause of the symptoms is by no means always easy. When the Eustachian tubes are open, the tympanic membranes normal, and there is no history of preceding deafness, it is by no means difficult. If, however, the history be indefinite, if the tympanic membranes be the seat of changes, which are, however, not in themselves incompatible with perfect hearing (*e.g.*, chalky deposits, thickened areas, &c.), it may be quite impossible to exclude change of tension in the tympanum as the factor of the labyrinthine symptoms.

If all the symptoms or any of them are relieved by inflation of the middle ear this points to the tympanum as the cause, or, at all events, as part cause of the symptoms; the converse is, however, by no means always true.

The fact remains that in a certain number of cases the localisation of the morbid process is impossible.

It will now be advisable to subdivide our subject in such a way as to satisfy clinical requirements.

Primary Disease of the Auditory Nerve and Labyrinth.—We have already referred to certain forms of deafness due to *intracranial lesions,* and although these were discussed in the preceding section, it was indicated that the symptoms may come on suddenly. It only remains to add that deafness is occasionally met with as a result of *cerebral hæmorrhage,* more especially, according to Moos, when the bleeding occurs into the pons or cerebellum. Cases of deafness due to *embolism of the middle cerebral* and *internal auditory arteries* have also been recorded.

Rheumatic paralysis of the auditory nerve has been met with in a few instances. It occurs either in the course of acute rheumatism, as observed by Moos and Politzer, or after exposure to cold as in a case recorded by Bing. The deafness is marked, bone conduction diminished or lost, but vertigo does not appear to have been noticed in any of the cases. Blistering behind the ear, iodide of potassium internally, and electricity, are the most suitable methods of treating this affection, which was recovered from in two out of the three recorded cases.

Primary inflammation of the labyrinth is a condition, the existence of which has been but rarely demonstrated on the dissecting table. Some years ago, however, Voltolini described the occurrence of cases which, he believed, were only to be accounted for on the supposition that the symptoms were due to primary labyrinthitis. The patient, usually a child, becomes feverish, sick, flushed, and finally delirious, or even comatose; convulsions, too, are not uncommon. When the child recovers, as it usually does in a few days, there is complete deafness and marked giddiness. Such a combination of symptoms is familiar to all aurists who, while they rarely have opportunities of observing the patients during the attack, frequently elicit this history in the case of deaf mutes. The deafness always persists, while the giddiness passes off gradually after the lapse of months. Gottstein, writing upon Voltolini's hypothesis, very strongly insists that the cases described as labyrinthitis were in reality abortive attacks of cerebro-spinal meningitis, which was epidemic in the neighbourhood of Breslau when Voltolini observed his cases. Indeed, there is little doubt in my mind that the clinical picture just sketched is really due to cerebro-spinal meningitis. Treatment of the deafness is, unfortunately, not likely to be attended by any success. If I were to meet with a recent case, however, I should certainly employ pilocarpine. The giddiness is always recovered from gradually, so that no special therapeutic measures are required; while the treatment of the acute stage should be conducted on the lines required in meningitis.

The Apoplectic Form of Menière's Disease is, however, by far the most important and common primary affection of the labyrinth.

As this is a non-fatal malady, opportunities of arriving at a definite conclusion concerning its pathology are rarely afforded. In the historic case recorded by Menière, that observer found a red plastic exudation filling the semicircular canals and extending into the utricle, and he, therefore, concluded that a sudden effusion of serum and blood had occurred. The symptoms and course of the disease point strongly to an apoplexy of the labyrinth. The patient, usually a robust adult, whose hearing has before been perfect, is suddenly attacked by tinnitus, intense vertigo followed by vomiting, and unilateral deafness, which usually becomes very marked in a few hours. While the acute symptoms last the pulse is weak, and cold sweat breaks out over the surface. Occasionally consciousness is lost at the beginning of the attack.

The subsequent course of the case is towards improvement, so far as the general symptoms are concerned, but the hearing remains permanently impaired or lost. The giddiness, which is at first so marked as to render standing impossible, soon abates sufficiently to allow the patient to walk. He, however, staggers as he goes, usually towards the side of the affected ear. The tinnitus commonly abates, but may persist, to some extent, for an indefinite period.

It is almost unnecessary, in view of what has been already stated, to warn the reader once more against mistaking the vertigo, which may occur in other forms of ear affection, for Menière's disease. In the latter there is a history of good hearing up to the day of the attack, immediately afterwards the affected ear is quite deaf, and bone conduction is lost or much diminished, while the tympanic membrane is normal.

The exact *diagnosis* may be extremely difficult or impossible in cases where Menière's disease is superadded to chronic disease of the middle ear. We shall see that certain forms of acute deafness, occurring in the course of chronic diseases, are practically secondary Menière's disease, differing from it only in their etiology.

The *prognosis* has been already referred to; it only remains to say that in very rare cases a certain amount of improvement in the hearing may follow treatment. One ear is only attacked, and, so far as my experience goes, there is no danger to the sound organ.

The *treatment* must be at first symptomatic, *i.e.*, rest, cold applications to the head, restricted diet, and the administration of a purgative. In order to relieve the giddiness, bromide of potassium should be given in full doses, and to it may be added a small quantity of iodide. Quinine in full doses, as recommended by Charcot, is, I think, a most unjustifiable form of treatment. The hypodermic injection of pilocarpine (⅛ gr.) should, as recommended by Politzer, be begun as soon as possible; for of all methods of treatment this is the most hopeful.

Diseases of the labyrinth and auditory nerve due to acute disease.—Idiopathic meningitis may lead to deafness, by causing destructive changes in the auditory nerve or floor of the fourth ventricle. The deafness is often bilateral and absolute, while, after recovery, more or less marked giddiness persists for a time. Occasionally the deafness is associated with blindness, or the implication of other cranial nerves.

Epidemic cerebro-spinal meningitis is, however, a much more common cause of deafness than the idiopathic variety. This disease may cause inflammatory changes, either in the nucleus of the auditory nerve, its trunk, or in the labyrinth.

The deafness seems to occur frequently in the first or second week of the disease. It is commonly bilateral, and generally nearly, if not quite, absolute. Bone conduction is lost, and for a time after recovery the patient usually suffers from giddiness, which causes him to stagger. The vertigo passes off after some months, but the deafness remains in most cases unchanged.

It must be remembered that inflammation of the middle ear may also occur in cerebro-spinal fever about the twenty-fifth day, according to Von Ziemssen; but the presence of objective changes in the membrane, the increased bone conduction, the pain, and eventually the discharge, will make its recognition easy.

On the continent of Europe and in America, where epidemics of cerebro-spinal meningitis are common, this disease is a very frequent cause of deaf-mutism. As is well known, the affection attacks children and young people by preference, being extremely rare after thirty-five. Probably no treatment is of any avail in restoring the hearing power. Pilocarpine and iodides may, however, possibly prove useful.

As we have already seen, the *exanthemata* frequently cause acute inflammation of the middle ear. Occasionally the labyrinth is also involved, or it may possibly be affected without coincident tympanic disease. When both are combined, Politzer designates the affection *panotitis*. To elucidate the pathology of these cases, Moos has spent much time and trouble. This authority has observed small-celled infiltration of the labyrinth in *scarlatina* (with secondary diphtheria), inflammation without suppuration, but associated with the presence of streptococci in the endo- and peri-hyphatic spaces in *true diphtheria*, small-celled infiltration in *typhoid*, and suppuration in *small-pox*. I am not aware that any pathological evidence as to labyrinthine disease occurring in the course of *measles* exists; but I have met with the condition so far as could be estimated by clinical evidence alone.

Probably in most cases the middle ear is affected first, and the labyrinthine condition occurs as a secondary result. The former gives rise to the ordinary symptoms, but there also exists an amount of deafness quite out of proportion to the visible disease. Not uncommonly the patient becomes quite deaf, both for sounds conducted through the air and by way of the cranial bones. On first rising from bed, the gait is usually staggering.

The prognosis is usually bad as regards the deafness, while the giddiness disappears. Moos found improvement result in a diphtheritic case from the hypodermic employment of pilocarpine, while Wolf had a similar experience with the same drug in scarlatina. In a case observed by me, and occurring in the course of measles, the hearing became, after a course of pilocarpine injections, almost normal; it must, however, be admitted that in this instance the labyrinthine symptoms may have been simply due to congestion. Perhaps the same remark may be considered as applying to all cured cases.

Mumps is an occasional cause of labyrinthine deafness. It is a somewhat curious fact that epidemic parotitis was recognised by the older English aurists as a very frequent cause of deafness. Thus, Toynbee wrote in 1860, "The peculiar poison which causes the disease, generally known by the name of mumps, is very often the source of complete deafness, which, however, usually occurs in one ear only." Again, Hinton, in 1874, expressed the following opinion, "Next, or, perhaps, equal in frequency to scarlatina in this respect, stands mumps, which has an effect on the nervous apparatus of the ear which has yet received no explanation." These observations seem to have escaped Continental authors, for, a few years ago, a number of cases were published in such a way as to indicate that the connection between mumps and labyrinthine deafness was only then beginning to attract attention.

Barr, in addition to describing two cases of his own, has collected thirty published by other authors. In twenty-two, the deafness was unilateral; in all, the deafness occurred suddenly, from the fourth to eighth day, and was accompanied by tinnitus. In eleven, giddiness was also a marked feature of the disease. The pathology of the deafness is still a matter of hypothesis.

Hitherto, treatment has not availed in these cases; but in view of the benefits occasionally derived from pilocarpine in other affections of the labyrinth, and in view also of the fact that metastatic orchitis occurring in mumps usually ends in recovery, this remedy should be tried. Arguing from analogy, we should expect a fair measure of success in a case taken in time.

Diseases of the labyrinth and auditory nerve due to chronic diseases.—In *leucœmia* the labyrinth may become the seat of hæmorrhage, or even of organised inflammatory deposits, as described by Politzer. The affection has been clinically studied by Gottstein, Blau, Gradenigo, and others.

Deafness, giddiness, and lost bone conduction are the leading symptoms; indeed, except in being secondary to the general disease the condition differs in no respect from that designated after Menière.

Hæmorrhage into the labyrinth may also occur in *pernicious,* and probably also in *simple, anæmia,* as shown by Habermann, and in *Bright's disease,* as rendered probable by observations of Walker Downie, Dieulafoy, and Pissot.

Sudden deafness may occur in *diabetes,* but although labyrinthine in character, its pathology has not been investigated.

Labyrinthine deafness may be met with resulting from an *epileptic fit.* Urbantschitsch has described a very remarkable case, in which complete deafness followed a fit, and lasted for two years, when it disappeared after another fit, although numerous attacks seem to have occurred during the interval.

By far the most common cause, among chronic diseases, of labyrinthine deafness is *syphilis.* Reference has already been made to the fact that in children hereditary syphilis often gives rise to a combination of middle ear catarrh and labyrinthine deafness. Further, it was pointed out in discussing chronic non-suppurative inflammation of the middle ear, that the typically syphilitic form may quite possibly be in great part due to changes in the labyrinth, in spite of the fact that the tuning-fork test points to the middle ear lesion alone. Typical labyrinthine disease is, however, quite commonly met with in syphilitic patients. It may occur almost immediately after infection or after the tertiary period has been established; it is also met with in hereditary syphilis. One ear only may be attacked, but, unfortunately, the affection is not uncommonly bilateral.

From anatomical investigations it is probable that in its early stages labyrinthine syphilis is manifested as an inflammation with infiltration of small cells, while at a later period changes occur in the osseous walls.

The deafness comes on rapidly, and, as we have seen, is often bilateral, while tinnitus is a more or less constant symptom. Giddiness by no means always occurs, and the comparatively frequent absence of this symptom has led Roosa to describe certain cases as *syphilitic cochlitis*. Whether this author be anatomically correct in employing this term is not yet known, but it is certainly true that the rapid onset of labyrinthine deafness without giddiness is strongly suggestive of a specific taint. Bilateral nerve deafness also, even when associated with marked auditory vertigo, should arouse suspicions.

In these cases the deafness is often absolute, bone conduction is absent or impaired, and low notes—if any power of hearing remains—are perceived better than high tones.

The *prognosis* in labyrinthine syphilis must always be considered doubtful, at the same time I have seen several cases of very marked improvement.

The *treatment* should consist in the employment of iodide of potassium in large doses and mercurial inunction, but those who trust to this line of treatment alone will not attain much success. Although, as we have seen, pilocarpine, as recommended by Politzer, may act beneficially in any form of labyrinthine disease, yet its success in specific cases is probably most marked. I have seen a case in which sudden and absolute deafness occurred owing to inherited disease, cured so far that the patient could hear any ordinary conversation; indeed, when I last saw him, no stranger meeting him could guess that he was deaf. The only symptom that persisted so long as he was under observation was that, while previous to his attack he had enjoyed music, afterwards melodies seemed discordant, and sometimes painful. In this instance the injections ($\frac{1}{8}$ gr.) were begun at once, but I have also seen benefit in a case of long-standing deafness. Labyrinthine deafness occurring in the course of leucæmia, pernicious anæmia, and Bright's disease might possibly be benefited by pilocarpine, but the drug would, in the two former, probably be contra-indicated on general grounds. Deafness following an epileptic attack is probably incurable in most cases.

Neuroses of the internal ear.—As "*angioneurotic paresis of the auditory nerve,*" Politzer describes attacks of deafness, associated with vertigo, tinnitus, and marked pallor of the face, depending probably on a neurosis of the sympathetic. All these symptoms pass off after a few minutes, and normal hearing becomes re-established.

A few cases have been recorded in which complete permanent deafness followed *violent emotion*, but nothing is known as to the pathology of this condition.

Hysterical patients sometimes become affected with deafness, which is usually unilateral, and often associated with general hemi-anæsthesia. In these cases, according to Walton, the deafness is usually in direct proportion to the amount of anæsthesia; occasionally, as pointed out by Urbantschitsch and others, the phenomenon of transfer can be very readily obtained. As an example of hysterical deafness I may permit myself briefly to refer to a case which was recently under my treatment.

A young woman who was deaf in both ears, to such an extent that she required to be spoken to distinctly, consulted me. The hearing power of both ears was nearly the same. The deafness was the result of long-standing catarrh, which had led to extensive atrophy of one membrane. This bulged in a marked manner on inflation, and, owing to suspicion as to the possible presence of fluid, the atrophic portion was punctured. Immediately after the little operation, the patient asserted that she heard worse, as she could no longer "blow out" her ear. The subsequent history showed that almost immediately on leaving my house she became absolutely deaf in both ears, and for some days required to be communicated with by writing. The hearing gradually returned, and, on examining her about a week afterwards, she heard just as before the operation.

The *diagnosis* in these cases is usually quite simple; the only difficulty in the case just mentioned lay in the fact that permanent deafness has been known to occur as a result of fright, and it was, until after her recovery, just possible that the emotion consequent upon the operation had acted in this way. I knew, of course, that the additional deafness caused by a careful puncture of a bulged membrane could not produce any marked change for the worse even in the ear operated upon, and could have no effect on the organ of the opposite side.

The *treatment* must be conducted on general principles, associated with strong suggestions as to improvement about to occur.

Among neuroses of the auditory nerve may be mentioned the curious association which exists in some persons between the auditory and optic nerves. Such individuals, when they hear a certain sound or musical note, have a subjective sensation of colour. The same note or sound seems in the same person always to be associated with the same colour. This phenomenon has been described by Baratoux as "*audition coloreé*," and by Bleuler and Lehmann as "*Schallphotismen*."

Injuries of the auditory nerve and labyrinth.—Deafness may result after head injuries, simply from *concussion of the auditory centres,* in which case it usually disappears without any special treatment, as in a case recorded by Schwartze.

In most cases, however, deafness following blows or falls on the head is due to irreparable lesion of the auditory nerve or labyrinth, although, in some cases, loss of hearing seems to be due merely to concussion of these parts. In fracture of the base, deafness in one or both ears is often observed after the patient has recovered sufficiently to notice impairment or loss of hearing. The aurist has seldom the opportunity of examining such cases until a considerable interval has elapsed. The usual history given is somewhat as follows:—

After a fall or blow the patient became unconscious; blood, and sometimes watery discharge (cerebro-spinal fluid) may have been noticed to come from one or both ears, in which case it may be assumed that there has also been a rupture of the drum membrane. After treatment for a varying period, the patient so far recovered as to take note of his surroundings. He then noticed that he was deaf in one or both ears, and commonly this deafness is associated with marked giddiness and tinnitus, while occasionally facial paralysis is also present. The subsequent history of a case, such as I have sketched, is usually unfavourable. The giddiness invariably disappears after a longer or shorter period, the tinnitus may or may not persist, but usually the hearing remains permanently impaired or lost.

The prognosis as to the auditory function rests chiefly upon the amount of deafness and the time which has elapsed since the injury. Even should the sound perception by air and bone conduction be altogether lost immediately after recovering consciousness, it is well to express a guarded opinion, for it is always possible that the deafness in any given case may be due to concussion of the labyrinth, or even of the auditory centres, and that improvement may occur. If, however, there be no improvement after several weeks, the prognosis is extremely unfavourable. Should the deafness be associated with facial paralysis, this combination points to a probable injury of both nerves in the internal meatus.

According to Schwartze, the anatomical cause of loss of hearing, after fracture of the base, may be one or more of the following conditions:—

(1) "Hæmorrhage into the internal ear, with tearing of the membranous labyrinth (usually complicated with fissure of the tympanum and meatus, and rupture of the tympanic membrane).

(2) "Squeezing or tearing of the auditory nerve, or compression of the same in the internal meatus.

(3) "Injury of the cerebral auditory centres."

Direct injury of the labyrinth is of rare occurrence. Schwartze points out that it may be sometimes observed as a result of rough attempts to extract a foreign body, and this I can confirm from personal observation. The same author has recorded a case in which a knitting-needle in all probability penetrated the labyrinth, and in which the injury was followed by a flow of cerebro-spinal fluid from the ear. Giddiness, pain, and cerebral symptoms, associated with fever, were the most noticeable features during the acute stage; afterwards permanent deafness, tinnitus, and more or less constant headache remained.

A *blow on the ear* may cause deafness, which is more or less marked, according to the amount of injury inflicted on the labyrinth. In some of these cases the tympanic membrane is also ruptured, but quite as often it remains intact. Sudden loud sounds, such as the report of fire-arms, an engine-whistle, and the like, may also lead to deafness or impairment of hearing; only the ear which happens to be directed towards the source of sound is usually then affected.

The *symptoms* of injury to the internal ear vary according to the extent of the lesion. The clinical phenomena associated with deafness resulting from fractures of the base have already been sufficiently considered. The other possible causes of deafness, which we have discussed, manifestly act, as a rule, only on one ear.

When the shock to the labyrinth has been severe, the patient feels giddy, or may even faint; this symptom is followed immediately by tinnitus, often of a high-pitched character, and when the first shock has been recovered from, it is found that the affected ear is more or less deaf.

The hearing may be completely lost or only impaired; at the same time the tuning-fork is usually heard badly, or not at all, by bone conduction. Impairment of bone conduction is, however, not constant; thus I have recorded the case of a medical man who became suddenly quite deaf in one ear after a fall from a horse, which was severe enough to render him unconscious; the middle ear was healthy, but yet the tuning-fork was heard better by bone conduction in the affected ear.

The *diagnosis* is comparatively simple in most cases, as the history, the absence of middle ear disease, and the usually diminished bone conduction form a clinical picture which it is not easy to mistake. In the case of coincident middle ear disease more difficulty will be experienced, and then the history, together with the presence of diminished or absent hearing by bone conduction, become of great importance. In such cases, too, the patient may be tested with notes of different pitch, and should the hearing for high notes be diminished, this may be looked upon as confirming the probability of a labyrinthine lesion.

It is just in this class of cases that *simulated deafness* may be met with, and it may be well to describe a few of the methods which have been used to detect malingerers. If the affected ear be said only to be impaired, the patient should be blind-folded, and the hearing carefully tested and registered on several consecutive occasions; in the case of simulation the results so obtained will materially vary. Another ingenious method, applicable to cases of supposed complete unilateral deafness, consists in connecting an ordinary speaking-trumpet with each of the suspected person's ears, and then getting two persons to whisper words alternately into them; after a time, unless the deceiver has accustomed himself to this test, he will become confused and repeat occasionally a word which has been spoken into the ear which he states to be deaf. Perhaps the most simple and satisfactory test is that proposed by Coggin, who makes use of a binaural stethoscope, the ear-pieces of which are inserted into the patient's ears; by means of a wooden plug he stops up the tube connected with the side upon which hearing is admittedly present, and if the patient then repeats words whispered into the stethoscope, malingering may be assumed. Obviously various modifications of this method may be tried; thus before the tube is blocked the patient may be tested, and the plug afterwards inserted without his knowledge. It has appeared to me that the presence of involuntary movement of the auricle, during the act of listening, might be a symptom of some value in excluding simulation. Every aurist is, or should be, aware of the fact that a very large number of patients, during the act of listening while the hearing is being tested, show more or less marked movements of the auricle. These I take to be indicative of a desire to hear, and when they exist I should feel inclined to exclude malingering. The results obtained by applying the tuning-fork to the middle line of the head may be of great value in detecting pretended deafness, for very often the malingerer will state that he no longer hears the vibrations when the good ear is closed, whereas this proceeding in reality intensifies the sound.

If complete bilateral deafness be pretended, and if the impostor be practised in his deceit, great difficulties lie in the way of detection. According to Politzer, the most efficient test is to ascertain whether the patient can be awakened by a moderately loud shout.

The *prognosis* in injuries of the labyrinth concerns, as a rule, only the question of hearing, vertigo, and tinnitus. In those rare cases where a direct communication has been established between the internal ear and the external air, there is also great danger to life, owing to the risk of secondary meningitis; in instances where the ear condition is caused by fracture of the base, the aural symptoms are usually not noticed until the sufferer is out of danger. As a general rule in all cases, the vertigo gradually disappears. The prospects as to tinnitus and recovery of hearing are, however, always uncertain. The prognosis is bad in proportion to—(1) The amount of deafness for sounds both by air and bone conduction; (2) the length of time during which deafness and tinnitus have lasted, although Gruber describes a case where spontaneous improvement occurred after an interval of more than two years, and Politzer met with an instance of sudden recovery after ten months. Immediately after the accident no decided opinion should be given, unless the impairment be very slight; and even then tinnitus may persist. Deafness following distinct fracture of the base is rarely recovered from, or even ameliorated.

The *treatment* of this class of cases is not very hopeful; some get better without our aid, while the majority remain deaf and afflicted with tinnitus in spite of every effort. In cases where the labyrinth has been directly injured, with resulting escape of cerebro-spinal fluid, all our efforts must be directed towards occluding the meatus, in order to prevent the entrance of septic organisms.

In cases of concussion it is generally recommended to deplete from the mastoid region by leeching, to apply cold, and to avoid exposure to loud sounds. Electricity has, of course, had its advocates, while Schwartze has faith in the efficacy of subcutaneous injection of nitrate of strychnia ($\frac{1}{30}$-$\frac{1}{12}$ gr.); pilocarpine may also be tried. My own impression is that, in this class of case, we have to deal with changes which are either irreparable, or which tend to spontaneous cure, and I very much doubt whether therapeutic methods can have any influence in determining the result.

DEAF MUTISM.

Mutism is almost universally the result of deafness, either congenital or acquired, during the first six years of life. It is true that, as we have seen, occasionally in hysterical subjects a form of mutism occurs suddenly, which depends upon functional paresis of the organs concerned in speech; occasionally, too, in children of deficient intellect articulate speech is difficult, or even impossible, and we shall presently see that such cases are sometimes difficult to differentiate from those of true deaf mutism.

Congenital deaf mutism is probably less frequent than the acquired form, but statistics are much at variance with regard to this point, which seems, from the very nature of the question, incapable of accurate solution. The etiology of congenital deafness has been very fully investigated by Hartmann and Mygind. The latter arrives at the following conclusions:—

(1) That among certain families there exists a distinct tendency to congenital deafness. It was found that in over 2 per cent. of cases there were relatives afflicted in the same way; strangely enough, however, it is extremely uncommon to meet with instances of direct heredity.

It must, however, be remembered that deaf mutes do not frequently marry, and that Hartmann has met with two instances in which both parents were deaf and dumb. In one case the parental affliction was congenital, and there resulted from the union five children, of whom four were mutes; in the other the father and mother were dumb as a result of acquired deafness (the result of scarlatina and measles respectively), and the offspring consisted of three deaf mute children.

(2) That relationship between the parents is an important etiological factor.

Both Mygind and Hartmann seem agreed that we have not yet sufficient data to decide the etiological importance of such conditions as—(*a*) Diseases or other injurious circumstances affecting the parents, although syphilis, nervous diseases, maternal impressions, and alcoholism have been supposed to cause a tendency to the production of congenital deaf mutism; (*b*) economic and hygienic conditions; (*c*) telluric influences.

It is, however, known that deaf mutism is more common in country districts than in towns. Further, mountainous countries show a higher percentage of cases than low-lying districts; this may, however, be accounted for by conditions other than climatic. European countries vary considerably in the percentage of deaf mutes (in which both congenital and acquired cases are included). Thus the Netherlands have the lowest number (3·35 to 10,000), and Switzerland has the highest (24·5 to 10,000), while in great Britain 5·74 deaf mutes exist to every 10,000 of the population.

The etiology of *acquired deaf mutism* is more easily investigated. Statistics seem to show that both on the Continent and in America intracranial disease is the most common cause. Thus Roosa, out of 103 cases, found the etiological factors as follows:—Cerebro-spinal meningitis, 27; scarlatina, 16; brain fever,[1] 13; meningitis, 4; measles, 7; fall on head, 7; unknown causes, 7; convulsions, 4; hydro-cephalus, 3; fever, 3; whooping-cough, 2; spinal trouble, 1; mumps, 2; pneumonia, 2; gastric fever,[2] 1; cholera infantum, 1; intermittent fever, 1; syphilis, 1; varioloid, 1. Hartmann and Politzer ascribe a large number of cases to typhoid fever; indeed, the former puts it on an equal footing with scarlatina, while the latter also mentions diphtheria as a cause. Boucheron seems to regard quite a large number of cases as being due to Eustachian obstruction ("otopiesis" as he calls it), while Hartmann also mentions that in some cases where naso-pharyngeal catarrh with indrawn membranes was found he succeeded in effecting improvement by local treatment. British statistics differ in some degree from those of Continental and Transatlantic observers; thus Toynbee found in 98 cases of acquired deaf mutism that the causes were as follows:—Scarlatina, 36; fever (?),[3] 23; measles, 4; teething, convulsions, hydrocephalus, falls, fits, fright, &c., 35. This difference is easily accounted for by the fact that both the Continent of Europe and America are often visited by epidemic cerebro-spinal meningitis, a disease which often leads to incurable deafness, and which attacks children by preference. Even in this country the aurist finds a considerable proportion of deaf children, the history of whose ailment points to idiopathic cerebro-spinal meningitis, the symptoms described being often feverishness, headache, sickness, lying with the head retracted, and marked vertigo, or difficulty in walking after recovery.

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[1] Cerebro-spinal meningitis (?)

[2] Typhoid (?).

[3] Nature not stated.

It is unnecessary to do more than touch upon the pathology of deaf mutism. According to Hartmann congenital closure of the external meatus is rarely a cause of deaf mutism, for the production of which the lesion must of course be bilateral; this author has only met with seven such cases in his literary researches. Inflammatory and destructive changes have been met with most frequently in the middle ear, but it must be remembered that this part is much more easily examined than the labyrinth. In the internal ear, also, various changes, some congenital (absence of labyrinth, absence and abnormal position of auditory nerve), and some the result of intra- or extra-uterine inflammation (thickening, degeneration, and atrophy), have been met with. A few cases are also on record where changes were found in the brains of deaf mutes, but these can hardly be said to be of conclusive value.

As a rule, if a child loses its hearing, or even becomes markedly deaf, before the age of seven, there is considerable danger of its losing the power of speech. Mutes are by no means always totally devoid of auditory sensation; thus, in statistics compiled by Hartmann, it is shown that 4·3 per cent. could still hear words, 11·2 vowel sounds, 24·3 other sounds, while the remaining 64·2 were totally deaf. Probably a child which loses its hearing, or a great part of it, before the age of four, will certainly also lose the power of speech; if, on the other hand, this misfortune overtakes it between 4–7 years of age, it will, according to Politzer, depend upon its intellectual development whether or not it becomes a mute, while deafness occurring at an age later than seven is rarely followed by mutism.

The *recognition of marked deafness* in a young child requires considerable care, and it is always advisable to reserve judgment until the patient is at least a year old. As a rule, however, the child exceeds this age before it is brought to the aurist, whose opinion is sought because of delayed speech. The opinion of the parents as to whether or not the infant hears is not always trustworthy. Many noises not only cause sound but also produce vibrations, which are appreciable by the sensory nerves, hence a completely deaf individual will react to the slamming of a door, stamping on the floor, and the like. In order to test the hearing power of young children it is necessary to observe how they react to sound, and in the production of such a sound it is of the first importance not to stimulate the optic or other nerves. The observer, therefore, stands behind the patient, whose attention is attracted by the mother or nurse, and produces a loud sound (*e.g.*, blowing a dog call, clapping the hands, ringing a bell). If this be heard the child will turn its head, or in some other way show perception; if several experiments yield a negative result there is probably very marked deafness. It is recommended by most writers to apply the vibrating tuning-fork to the bones of the head, a proceeding which is stated to produce a smile if the vibrations be heard. I cannot say that I have been so fortunate as to elicit these signs of pleasure from infants, and therefore do not place much reliance on this test. Even should it be clear that a certain amount of hearing exists it by no means follows that the child will have sufficient appreciation of sounds to enable it to learn to speak.

When the patient is several years old it is comparatively easy to test the amount of hearing, as at this age attention is readily attracted. A question which is often lost sight of in the examination of these cases is whether the dumbness be due to deafness or idiocy. The decision depends upon the presence or absence of other symptoms pointing in the direction of the latter. The deaf mute child is usually bright, active, and of an inquisitive turn of mind.

It must, however, also be remembered that a few cases are on record where, without being deaf or idiotic, children are unable to acquire speech. Such a case has been recorded by Broadbent, who ascribed the condition to "an absence of the faculty of mental rehearsal of phrases." Uchermann also has placed on record four cases of mutism without deafness, two of which were congenital, while one was caused by a fright at the age of 2½ years, and the fourth was found to be due to paralysis of the tongue.

The ears should be examined with the speculum in all cases of suspected deaf mutism. In many instances the drum membranes are much indrawn, and often this will be found associated with evidences of nasal and pharyngeal catarrh, or even of adenoid vegetations; perforation and thickening of the membrane may also be met with. In estimating the *prognosis*, however, too much stress should not be laid upon the evidences of middle ear disease. In the majority of cases treatment directed towards these will leave the condition of the patient unaltered. In a certain number of instances congenital deafness is slowly recovered from, as pointed out by Politzer, Hartmann, and Mygind; the first-named authority, however, considers acquired deaf mutism always incurable. Boucheron, on the other hand, has recorded good results from the employment of Politzer's method and the Eustachian catheter.

In the *treatment* of deaf mutes, not much is therefore to be expected from local therapeutics; at the same time, any existing ear disease should receive attention, as recorded cases show the possibility of effecting a cure in rare instances. If a child's hearing be impaired, it is most desirable to impress upon the parents the necessity for keeping up its speaking powers, even if conversation should have to be conducted with the aid of a conversation tube; if the patient can already read, this is more easily accomplished.

When speech has become lost, nothing remains but to adopt the so-called German system of oral instruction and lip-reading. This consists in making the patients speak by imitating the movements of the lips and tongue, while modulation is secured by feeling the vibrations of the teacher's larynx, and attempting in this way to control the natural harshness of the laryngeal sounds. The defect in hearing is compensated by observing the lips of the speaker, and thus discovering the words uttered. There can be no doubt that the results obtained in this way are so satisfactory that it is little short of a national scandal that our government in this wealthy country does not place some facilities in the way of providing such education for the poorer classes.

According to Hartmann, a few mutes only are so successfully instructed that a stranger conversing with them does not notice their infirmity. Excluding such brilliant results, one-third can converse with all and sundry, but their speech has a peculiar character; a second third have these defects more marked, and can only be understood by acquaintances; while the remaining third lapse again into the language of signs. The most successful examples are those of individuals in whom intelligence is high and some hearing remains, while the totally deaf, and especially the stupid, have more difficulty in mastering the oral method of instruction.

When a child is deaf and has lost speech, it is most desirable that methodical instruction by a competent and experienced teacher should begin at the age of seven, and continue, if possible, for six or eight years.

ARTIFICIAL AIDS TO HEARING.

Whenever a patient has reached such a stage of deafness as to render him incapable of fulfilling his duties, or to unfit him for social intercourse, it becomes desirable that he should be supplied with an apparatus which will, so far as possible, obviate his difficulties. It would be an immense boon to the deaf if some invisible, and, at the same time, efficient instrument could be invented; but hitherto all attempts in this direction have failed. The small tubes often made—or said to be made—of gold, intended for insertion into the meatus, are only of use in those extremely rare cases where, owing to senile changes, the cartilaginous portion has become so collapsed as to completely close the canal. Politzer found that by prolonging the tragus backwards, the hearing power is, in many cases, improved, and on this basis constructed small trumpet-like flesh-coloured tubes of vulcanite, which are introduced so that the external orifice looks backwards; in some cases their use certainly improves the hearing, but patients complain of the mechanical irritation. The same authority has more recently suggested the employment of an instrument, the essential part of which is a piece of drainage tube, one extremity of which is in contact with the tragus, while the other rests upon the drum membrane. The object of this appliance is to convey vibrations of the auricle directly to the tympanic membrane.

Other instruments have been constructed in order to convey sounds through the bones of the head to the labyrinth. The best known of these is Rhodes' *audiphone,* although Urban Pritchard had previously achieved success on the same lines. The appliance consists of a plate or fan of hard rubber or cardboard, which is kept bent by means of a cord, and the edge of which is applied to the teeth so that the convex surface is directed forward. The *dentaphone* is simply a modification of the audiphone. Paladino's "*fonifero*" is a rod which connects the larynx of the speaker with the teeth of the listener. Of these instruments, the audiphone (or a disc of pasteboard used in the same manner) is undoubtedly the best. It was at one time hoped that this appliance would be of marked service in all cases where the internal ear was intact; but these expectations have not been fulfilled, and it is now recognised that only a very limited number of cases can be thus benefited.

We are, therefore, in most instances thrown back upon the ordinary and well-known conversation tubes, ear cornets, conches, etc. I do not think that the surgeon can ever prescribe the form of instrument most likely to be of service in any given case, so that my invariable custom is to advise the patient to obtain a selection of these appliances, and carefully test them at home. The points to be especially attended to are (1) that the hearing is improved; (2) that there is not so much resonance as to make audition painful.

The forms used are:—

(1) Conversation tubes of fine wire, covered with cording or rubber. If it be desired to employ one of these to facilitate reading aloud, a larger mouthpiece than usual may be mounted on a stand and placed before the reader, as suggested by Von Tröltsch. In some churches a similar system is adopted in order to connect the pulpit with seats set apart for the deaf, into which a number of tubes with ear pieces are led.

(2) Apparatus which push the auricle forwards, and can be worn by ladies without attracting much attention.

(3) A meatus tube connected with a small trumpet, which is flattened from above downwards, and opens anteriorly, the whole just covering the auricle. These, too, can be worn by ladies so as to be, in great part, concealed by the bonnet strings. In Paris a modification of this instrument is made, in which the surface directed towards the auricle is moulded to the shape of the part (conch).

(4) Trumpet-shaped apparatus, usually made of metal. These are particularly useful for hearing in public places.

It may also interest the reader to know that such artificial aids to hearing are now made concealed in articles of every-day use, *e.g.*, umbrellas, walking-sticks, head-dresses, and coat sleeves. This fact the patient will usually find out for himself. I regret to say that I have found it necessary to warn patients never to buy an apparatus until they have satisfied themselves of its utility; this caution is necessary, as I have known persons persuaded by unscrupulous dealers to purchase perfectly useless but very high-priced appliances.

Rettig of Saarbrücken has for some years been devoting his attention to the construction of ear-trumpets on strictly mathematical principles, and claims to have succeeded. So far, however—possibly owing to the price—his instruments have not come into general use.

In most cases, patients will themselves be the best judges as to when it is desirable to use an artificial aid. In the case of deaf children, the aurist may, however, find it necessary to order the employment of a conversation tube to prevent the occurrence of mutism.

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